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TRANSACTIONS

of the

Odontological Society of Pennsylvania.

THE REGULAR MEETING OF THE SOCIETY WAS HELD SATURDAY EVENING, JANUARY 5TH, 1889, AT THE HALL, THIRTEENTH AND ARCH STREETS.

President Kirk in the chair.

A paper was read on

THE ADVANTAGES OF COTTON AS A ROOT CANAL FILLING.

BY JOSEPH HEAD, D.D.S.

At the tenth anniversary meeting of this Society, held in December, not a single objection was raised against cotton root-canal fillings, which, in my opinion, did not equally apply to those of gold, oxyphosphate of zinc, or gutta-percha.

It was said that cotton was prone to absorb fluid from the tissues around the apex of the root, which fluid, undergoing decomposition, was likely to cause alveolar abscess.

For the present, this statement shall remain undisputed, although I hope, before the reading of this paper is finished, to prove to your satisfaction that such is not the case.

It is unnecessary for me to describe the method of treating single rooted teeth, such as the canines and incisors. Since the orifices of the canals are evident and the line of direction straight, enlarging, cleansing, and thorough adaptation of the root filling is extremely easy. In fact, so few difficulties are these teeth likely to present, that the student may be quite as successful in their treatment as the expert.

Therefore, let us consider only the teeth which are difficult to quiet, feeling well assured that in learning to apply the proper therapeutic skill to these, we shall at the same time be mastering the methods to be used in combating all the lesser evils.

In pursuance of this idea, I would invite you to consider with me the treatment of bicuspids and molars. Yes, the manner of dressing and filling molar roots shall be the subject of discussion, for these as a class are likely to give more trouble of a peridental nature than all the rest of the teeth combined.

Why? Because this class, not only being larger than any of the others, contain forty canals, each capable of causing an alveolar abscess, while all the other teeth can muster only twenty-four. And because a tooth containing two or three canals is two or three times as likely to give trouble as a tooth which contains but one. With this hasty explanation let us now proceed to inquire if gold cement or gutta-percha can justly be said to make a permanent or perfect filling.

At the late anniversary an eminent practitioner told me that he first measured the end of the canal and then filled the apical end solidly with gold. So great was his regard for his method, that he did not approve of cotton fillings.

I wondered how he would manage to do this to the anterior buccal canal of a superior molar. I should have been satisfied had he told me how he would measure and fill solidly, with gold, the flat roots of lower molars, the canals of which so frequently sub-divide, leaving between the two branches a translucent plate of cementum.

It occurred to me, that while enlarging these sufficiently for the complete accomplishment of his design, that there would be danger of boring into the alveolar process, the blood thereby spoiling the perfect adaptation of the gold. Should his practice become general, it would probably work great injury to all roots containing minute, flat, or tortuous canals. As in so treating them would he not, in all probability, either perforate the root, or leave untouched a large portion of the canal, into which it would be impossible thoroughly to pack the gold? There being no method of venting the tooth, would he not incur the risk of alveolar abscess with all its horrors?

Another experienced practitioner said that after sterilizing the canals, he pumped into them gutta-percha dissolved in chloroform, and then packing the root with gold, made, as he said, a filling so impervious to fluids from without, that alveolar abscess was an impossibility; or, at least, so improbable that its occurrence was not to be considered.

This method at first sounded plausible, but, after deliberation, it appeared to me that his materials were not equal to good gutta-

percha. The gold in his case, occupying the position of an inert mass, could only serve to block the canals should trouble arise. While all the responsibility of excluding noxious fluids was given to gutta-percha, the real strength and toughness of which had been destroyed by the chloroform.

It is not necessary to prove to you that dental gutta-percha is porous, that is, it does not make a water-tight filling. These facts are too well known, but if a skeptic be present, a single sniff at the gutta-percha found around most of the pivot teeth set in that material will fully satisfy his doubts as to its porosity; while the fact that it leaks has been proven again and again by the glass tube and analine ink test.

Therefore, if dental gutta-percha be not a bar to the fluids of the blood, and if it cannot be denied that it absorbs decomposable liquid, and not being a vehicle which will combat putrefaction, how can it be called a perfect or permanent filling?

How is it possible to suppose that a root so filled can be granted immunity from gases which cause alveolar abscess. How can it be believed that this much lauded material is even as good as the despised cotton, which does not pretend in itself to exclude moisture, but acts solely as a vehicle for retaining medicine which will keep out fluids and at the same time prevent the development of putrefactive germs still lingering within the canals.

Dental gutta-percha not only offers free entrance to fluids of the blood, but, being inert, affords these germs an excellant harbor where they may multiply with the greatest rapidity.

But perhaps some of you at this moment are anxious to rise and speak as follows: "How is this, my young friend? Gutta-percha porous? Consider that the Atlantic Cable is wrapped in gutta-percha, and if a single drop of water should leak into it so as to touch the metal, the cable would be useless." To this I should reply as follows: "Respected sir, I am not speaking of pure gutta-percha, but of the material used by dentists. Pure gutta-percha has not sufficient body to be used in our profession. Oxide of zinc, which is extremely soluble, is usually mixed with it, and when the zinc is dissolved, the gutta-percha becomes like a sponge."

But granting that the gutta-percha be mixed with an insoluble powder, still gutta-percha, being a leaky material, allows the fluids to enter beside the earthy particles of the powder, and is, therefore, only slightly less pervious than when oxide of zinc is used. Should base-plate, which is almost pure gutta-percha, be used, the

same objection may be made, as it is also mixed with a powder and presents the insurmountable difficulty of not making a water-tight joint, thereby incurring the risk of alveolar abscess.

What has just been said of gutta-percha is equally applicable to cements. True, they make a tight joint; but then they are so porous that they have all the harmful properties attributed to gutta-percha, and also an important additional one, namely: that it cannot be removed, and, if trouble arise, relief is impossible except by counter-irritation or puncture of the alveolus.

Counter-irritation, in most cases, seems like trying to put out the sun with a squirt-gun; for, if the abscess has to run its course, the slight success which a dentist's conscience permits him to attribute to his efforts is often unperceived by the patient. While puncturing the alveolus is not only a severe operation, but too often unattended with any other result than an increase of pain, failure is either due to the fact that pus has not yet formed, or that the pus cavity has been missed by the drill. While we are on this subject I should like to ask two questions about alveolar abscess.

Does not the patient suffer prolonged and excruciating pain before pus is formed? Before the pus is generated in a quantity sufficiently large to be successfully pierced, has not the patient endured by far the greater part of the pain which would naturally fall to his lot?

Gentlemen, I think you will answer both these questions in the affirmative, and, therefore, taking into account the uncertainty and discomfort occasioned by the drilling, the expediency of relying on this operation as a means of relief can be questioned with some appearance of logic. Therefore, it would seem that the dentist who accepts these facts, and yet, in a case of simple treatment, knowingly uses an irremovable canal filling which has the defects above explained, wilfully subjects his patients to the risks of not improbable alveolar abscess with all its accompanying horrors.

Gutta-percha, in roots where pivots are placed, can, as a rule, be readily removed from the canal, should venting be necessary. Hence, this material should always be preferred whenever its use will ensure sufficient stability; and where cement is necessary to render venting easy, a small piece of gutta-percha, or a small pellet of cotton dipped in an antiseptic, should first be placed at the apical end.

The advocates of the so-called permanent root fillings, gold, gutta-percha, and cement, claim that these agents absolutely exclude putrefactive germs. And, moreover, the root being sterilized previous to filling, that these materials so protecting it will soon

make alveolar abscess one of the lost diseases. Are these statements borne out by facts? Do not these fillings contain all the disadvantages which have been attributed to cotton? It is said that cotton is not water-tight. Are the other materials water-tight? It is said that it absorbs fluid which, decomposing, gives rise to irritating vapors. Do not gold, gutta-percha, and cement also give rise to irritating vapors?

But the great advantages of a cotton filling have not been justly rated.

Firstly, it can be easily removed. Secondly, it can be thoroughly permeated with medicaments which will not only destroy septic matter, but prevent its entrance.

In reply to the first of these statements, our learned friends claim that alveolar abscess, in teeth treated by their method, is so improbable that the removal of the filling is never necessary, external treatment meeting every requirement.

Well brother practitioners! if, after the review which has just been made of the obvious imperfections of gold, gutta-percha and cement as canal fillings, these gentlemen still adhere to their opinion, it must be confessed that I am unable to find any argument which might convert them.

Therefore, without further discussion of the great advantage which cotton has in its easy removal, I will pass at once to the consideration of cotton as a medium for antiseptic medication.

It has been said that "The medicament evaporating, leaves the cotton unguarded."

Gentlemen, have you ever heard of carbolized cosmoline? and will you kindly inform me what is its daily rate of evaporation?

It is with carbolized cosmoline that a cotton dressing should be soaked.

The late Dr. H. A. Randolph boiled a frog's foot in pure cosmoline in order to destroy any putrefactive germs which might remain, and then allowed it, covered by the paste, to stand for an indefinite time. Week after week the foot stayed unchanged, the experiment proving that cosmoline is aseptic in the highest degree, and that a sterilized body placed in it will remain intact so long as it is covered.

Therefore, gentlemen, it seems to me strongly indicated by the majority of facts; for these experiments can be verified, that, while gold, guttapercha and cement have all the faults attributed to cotton, cotton is in reality the most permanent and easily adjusted of root fillings.

The use of cosmoline in canals is not original with me but was first suggested by Dr. St. George Elliot, of London.

Having now given you my defense of cotton fillings, let me, with your permission, proceed to consider how and when they should be inserted.

Any practical method of cleaning and sterilizing the canals can be used, but where the pulp has putressed, I invariably employ the gradual stopping process which is so clearly explained by my beloved and respected friend, Dr. Flagg. Of course, you are all familiar with it; but to keep the links in my chain of evidence perfect, with your permission I will explain his manner of treatment, which has the advantage of cleansing with equal thoroughness the small and large canals.

The tooth must first be opened and the floor of the pulp chamber so burred that the mouths of all the canals visible or invisible shall be exposed.

Then if considered practicable they can be enlarged, extreme care being taken not to puncture the cemetum.

At the first sitting all the decomposing material that can be reached should be removed. And after the passages have been thoroughly washed by streams of warm water squirted into them from the syringe, they should be dried and protected by the napkin or dam. Finally being filled loosely with a cotton dressing thoroughly soaked in pure carbolic acid, or whatever medicament may be preferred.

This, of course, should be done early in the morning. The advantage of choosing such an hour has been known to dentists for a long time. Its scientific explanation is easy.

The velocity of the blood is greatest at nine o'clock in the morning and six at night. Its ebb tide is about one P. M. and at midnight. [See Dalton's Physiology, p. 313.] This fact effectually answers all speculation on the subject. When the rapidity of the blood is increasing, any irritation will end in inflammation much more readily than when the velocity of the vital fluid is on the ebb. Therefore, judging from this fact, were we so inclined we could treat teeth with equal advantage, at six or seven P. M. But, of course, this not being feasible, the morning hour is the hour usually chosen. On the following day the syringing and replacing of the dressing should be repeated, the dressing being packed a little tighter. This should be continued each consecutive morning until twisted cotton, soaked in carbolic acid, can be firmly packed into

the canals and there remain, the tooth being absolutely free from inflammation.

Extremely sensitive teeth with open canals have yielded to this treatment again and again, becoming sound and painless in a few days. Should the tooth resist the first treatment in the morning, allow cotton to rest in the canals very loosely, and tell the patient to return at eleven, when the treatment again being performed, the pain will, in almost every instance, abate.

By following this plan, any little accumulation of gas may be removed, and yet the advantage remain of treating while the blood is still on the ebb.

By this method the hair-like canals are perfectly cleansed: for the organic matter putrifying in them is each day washed out, while each cleansing is followed by an application of carbolic acid, which if the tooth is dried, will go into places inaccessible to cotton.

With these means I think you will confess that any canal, no matter how minute, can be cleaned and sterilized. This being accomplished and the last dressing allowed to remain, the tooth should be temporarily filled with gutta-percha or cement for a length of time sufficient to test the thoroughness of the work; which having been satisfactorily demonstrated the tooth may be permanently filled. The details are as follows:

Put on the rubber dam, remove dressings and blow hot air into the tooth until it becomes painful. Then, using a hypodermic syringe filled with warm carbolized cosmoline, pump the canals full.

In dealing with the large canals this will be an easy process. In those of a small diameter the passage of the cosmoline to the apex will be aided not only by capillary attraction, but also by the contraction of the cooling air. By finally pressing a pellet of cotton soaked in cosmoline over the small orifices, and then inserting a minute shred of cotton wherever possible, it seems reasonable to suppose that the canal can be filled to the apical foramen, with an antiseptic substance sufficiently viscid to exclude moisture from without. Cotton should then be packed in the large canals to act as a support for the medicament.

The canals should be filled with cotton to the pulp chamber, and a small pellet soaked in cosmoline placed over the orifices of those which are too small to allow the entrance of a thread. The cavity should now be washed with chloroform to remove superfluous grease, and the pulp chamber filled with gutta-percha or cement. I connect the mouths of the canals with protected cotton in order to expedite venting, should it be necessary. This is

merely my personal preference. It is not essential. The filling to be used in covering the contents of the pulp chamber of course must vary according to the individual peculiarities of the tooth.

How is it possible for a tooth thus treated to need venting?

Because in every case there is a strong probability that the outer portion of the apical foramen may be unprotected, and, moreover, the place where the living and the dead tissues join is always a weak spot. And after all has been said and done, and the greatest care has been used, a gouty, lymphatic or plethoric patient may most unexpectedly give us a very serious example of peridontitis.

I must add, in closing, that the dentist who can always be certain of his work, in such patients, must not only be extremely sanguine, but remarkably fortunate.

This paper has been written for the purpose of showing that cotton is a legitimate root-filling. If, in the course of my argument, the disadvantages of gold, cement and gutta-percha have been brought to light, it was purely accidental.

My intention is not to prove the advocates of recognized and well tried methods unlearned, or, what is worse, unprofessionial, but to remove the stigma from the advocates of cotton dressings. No man can justly be called unprofessional, until it is clearly shown that he advocates a method contrary to the highest teaching of the day. And, before a method can be proven illegitimate, its adversaries must first clearly demonstrate that they know a process indisputably better.

These statements being accepted, it alone remains for the advocates of gold, gutta-percha and cement to prove that these materials do not have the faults attributed to cotton, and also to prove that the obvious advantages of cotton do not more than compensate for its disadvantages, whatever they may be.

All are anxious to have this question settled. If the use of cotton-fillings is bad practice, point out concisely in what respects the use of gold, gutta-percha and cement for root-filling is superior.

Let the following questions be distinctly answered:

1. Can gold be packed in the delicate canals of molars so as to exclude serum.

2. Does not gutta-percha leak, thereby allowing free entrance of putrefactive agents into the sterilized canals?

3. Does not cement, being porous, offer similar objections.?

4. And cannot a perfectly water-tight, easily-removable filling, be made with cotton dipped in a thirty-five per cent. mixture of carbolized cosmoline?

DISCUSSION ON DR. HEAD'S PAPER.

Dr. James Truman—I do not feel any more convinced in listening to Dr. Head's paper than I was by his remarks at the Anniversary Meeting, when I expressed my opposition to cotton filling. I have some forty years behind me in the treatment of root canals, and over thirty years in which I have practiced all the various modes of filling except that with cotton. When I hear it stated that gold fillings in root canals are failures, my mind goes back to the operations of our older practitioners, Maynard, Townsend, Westcott, Dwinnelle, and others, and wonder if all their operations were failures. I used tin and gold exclusively for this purpose for many years prior to the introduction of oxy-chloride of zinc, and the cases were few where I failed to accomplish good results. We are unfortunately only too well aware that it is impossible to fill all roots perfectly, notably the buccal roots of the superior, and the anterior roots of the inferior molars; but can Dr. Head, and those who think with him, have better success with cotton? It seems to me impossible to force this into tortuous canals any better than the denser materials.

The experiment with gutta-percha in glass tubes might be conclusive if glass could be depended on. It is not a reliable material to fill against, being subject to expansion and contraction, and must eventually permit the analine to pass in at the edges. We do know clinically that gutta-percha will prevent leakage for years and years, and I think it will be difficult to show teeth better preserved than with this material. I cannot discuss the filling of canals with cotton and cosmoline. There is a possibility that cosmoline may have an advantage over carbolic acid alone, for that agent has its limitations as a germicide.

We do not want to remove a filling after it is once inserted. To fill with this idea is, to my mind, a fallacy. If we have treated the canal properly in the first instance, we want a filling placed where it will stay. I pack the gold in the canals with the mallet, and know that it will not leak there any more than it will externally.

I took the position—and the paper is an answer to one I read at the Anniversary Meeting—that before filling a canal it must be properly treated, and I further contended that no tooth was properly prepared where the canal was not free from decomposed tissue, and I stated, further, that as the dentine was made up of innumerable tubes, and that these tubuli contained organic matter, and if this material, undergoing decomposition, is not included in the treat-

ment it becomes a constant source of danger to the tooth. I enforced the opinion that it was necessary to reduce this to an insoluble compound, and that this was best done by keeping the canal under the action of oxy-chloride of zinc. This, in my judgment, is at present the best known filling material for canals. I am aware that cotton is a good filter for micro-organism, and as long as it is not disintegrated in the canal it may be an effective agent; but when this does occur the results are exceedingly disastrous.

Dr. J. D. Patterson, Kansas City—Twenty years ago I had the misfortune to use cotton fillings, following the precedent of my preceptor. We did not use carbolized cosmoline as a dressing, but what was common at that time, creosote and carbolic acid. The frequent failures resulting from that practice, together with the advice and experience of others, caused me to soon discard it, and for a great many years I have employed another method. I do not wish to criticize. If it were not for the variety of opinions it would be useless for dentists to come together for discussion. I have great respect for those who take a bold stand and back their assertions with logic.

With all deference to Dr. Head, I have no confidence in the method he represents. It is no doubt better than the old method of carbolic acid alone, or better than the old English method of using cotton with sandarach. I think other methods are better in point of efficacy. There is an objection in mind to gutta-percha, so universally used throughout the West, and that is its tendency to leakage, I have found the fault present many times.

With regard to Dr. Head's experiment with the glass tube, if he will conduct one more he will have a different result. Take one of those tubes and by melting draw it into a fine thread, afterwards grinding it off. Then pack into it a gutta-percha filling up against this small opening, sealing the rest of the tube carefully; put the tube in a vessel of analine, or any other fluid, and you will have no leakage. I prefer to fill the apical portion of the canal to a small distance with gutta-percha; then the balance of the canal with oxy-chloride of zinc. In young teeth it can be forced perhaps into the dental tubuli. It is an antiseptic, and when hard renders the organic matter a fixed material. I object to filling the root entirely with oxy-chloride on account of forcing through the foramen. A great many use a solution of base plate gutta-percha. I recommend a solution of the white gutta-percha, for by experimentation I have found tbat there is not so much leakage.

Dr. L. A. Faught—For many years I have filled roots of teeth with cotton, and one reason for my so doing is that I have learned the value of such proceeding from both ends of the instrument. I have been a patient as well as an operator. That such fillings are as satisfactory as any others is beyond question. I have in my mouth a lower molar which has been root-filled with cotton for seventeen years, and I have yet to have the least trouble with it. If all the roots I treat give no trouble in half that time, I shall be satisfied with my results as an operator. In answer to the question: "Why do we want to remove the filling?" I would say that if when trouble arises the patient returns to us, we can, by reference to our records, recall what has been done, and if such reference shows that what was previously accomplished was as thoroughly done as possible, then we do not want to take the filling out. Many patients, however, do not return to us, but they drift to others, or possibly when they seek us we are absent from the office, and relief is sought elsewhere. It is in such cases that—not knowing how thoroughly the treatment was originally—the operator removes the root filling so that he may be sure to place the tooth in good condition for the future. If the canal has been filled with cotton he can do the work with ease and give comfort to the suffering patient.

Dr. Alonzo C. Boice—Is not the whole object to prevent any leakage through the apex? The question then is what is the best method? I cannot succeed with gold, gutta-percha, nor oxy-chloride of zinc. I find it impossible to pack them in the canals. If you take a little cotton and pass it to the end of the root it stays there, and if the canal is dry it is all right. I lately had the privilege of taking a cotton filling out of an old root of a first bi-cuspid tooth. It was sealed in with gutta-percha, the cotton being packed the length of an inch. It was in twenty-five years, and was as sweet as you could wish. It was first filled with gold, then amalgam, and finally patched up and a crown put on. In the discussion we all acknowledge that the canal must be thoroughly cleansed. If it is thoroughly prepared and dried, and you put a filling in the end of that root, will there be any trouble? I have had more success with cotton than with any other material, although I do not always have success with it. I have taken out fillings of gold that were not very pleasant.

Dr. Bonwill—During eight years of my earlier practice, I filled with nothing but gold and tinfoil. Sometimes I had an abscess, and I know the reason, the nerve was not thoroughly

extirpated. In some small cavities it is impossible to introduce a broach, and at that time it was difficult to get a good one, as little was known about them. My knowledge of inflammation led me to experiment—to thoroughly extirpate the pulp and leave the cavity open. Many roots which have not been sterilized have given no trouble. I found that whether the pulp was treated with arsenic or not, it made but little difference, the secret of success being in the extirpation of the pulp, and when this was done it did not matter whether you filled the pulp chamber and canals or not.

After a little judgment, and some practice and experience, I commenced to experiment with cotton. The early experiments of Pasteur sufficiently justified anyone in such treatment. He took two pans of milk—one with cotton over it and one without. That which had the cotton over it would stand for days and weeks without any change. That which had nothing over it, and came in direct contact with air was soon changed. Another thing I know, cotton can be worked so thoroughly—can be packed so solidly that you cannot get moisture into it. Knowing the difficulty I had in a great many small cavities of getting gold and tin to the apical portion of the canal, and the occasional trouble I have had with them afterwards, it led me to go into the treatment with cotton, there being no trouble in packing a fibre of cotton. With it I have saved without abscess ninety-five per cent. of the cases that have come to me. It has done for me what I am perfectly satisfied I could not have done with any other material. You cannot pack gutta-percha nor get the chloroform mixture there except in a large canal. When it becomes necessary to open into any canal filled with cotton you will find it an easy operation. If filled with gold, as soon as you put the dental-engine upon it and heat it up, it will throw out gas, showing that the tooth substance has absorbed gases. Cotton cannot do any more. I can recall many instances where I put in cotton many years ago, and it has never given any trouble.

Dr. Bennett—Dr. Flagg, speaking of pain about devitalized teeth, calls the peridental membrane the "seat of war," and I think the same term may be not inaptly applied to root canals, as a theme for discussion. And the war still goes on apparently as far from the end as ever. But we have made progress recently as to *cleansing* and *treatment* of canals, which are after all the essentials of success. Little has been said about the sources of our knowledge, experimentation, and experience. There is always a difference in tests made in the tooth and in substances of a different nature.

I have tested in glass tubes, and I cannot say I would depend as much on such tests as on those made in the teeth. The experiment shown by the essayist does not resemble a filling in a canal, but the method suggested by Prof. Patterson is something to the purpose. You can depend on a test like that every time.

If a man is successful with any method he is entitled to be heard. But then what is success? It certainly has degrees, while failure is something more definite. As to root filling, I do not think that cotton is bad under all circumstances. I would not, however, call it filling, but *treatment continued*, for do not its advocates depend on it as a "line of retreat?" And have not these same men the most to say about "retreating?" Some generals as well as operators lay more stress upon such a "line," and seem to need it more than others. The operator who fills the canals with copper amalgam must feel sure of his ground, for this, above all things, is not a "serial" filling.

I have had cases of very bad teeth that I did not venture to fill for a long time, but kept the canals full of cotton saturated with bi-chloride of mercury and iodoform. In such cases, however, it is the *medicine* and not the *cotton* that is depended on. Iodoform is the most persistent and permanent of medicines, and is therefore the best to counteract a persistent septic condition. Nearly all other medicines disappear in such cases as I referred to, odor and all, and that, too, no matter how perfectly the canal was cleansed or how well it was corked at both ends.

But filling is only one thing, and not the most difficult or important. Cleansing the canal and disinfecting or desiccating the tubuli and closing the foramen are the first three essential steps to successful treatment. If a canal must be enlarged, and I for one often find this necessary, first dry it thoroughly with hot air, so that no septic fluid be forced through. Begin with the larger drills, Morey or Gates-Glidden, and proceed gradually to the small ones. For the rest, poison and burn out the germs and gases. These, not the *filling*, are the points that count.

As to filling, I regard cotton at one extreme and gold as the other. Both are primitive materials. Cotton is easily applied and not conducive to cleanly and careful work; gold is simply a stopping, and requires skill for its insertion. Of the other two materials, gutta-percha and oxy-chloride of zinc, they are the best adapted to the greatest number of cases and operators. Gutta-percha, like gold, is merely a stopping; but when it is forced through, it is, unlike gold, non-irritating. It has been said that it is permeable by gases

but what material is not? Oxy-chloride of zinc is the only material that reacts on the gases, or that has any effect on the organic portion of the dentine.

Dr. H. C. Register—If I understand the purport of the paper it embraces the filling of pulpless teeth under all conditions. The discussion, to my mind, refers only to the immediate filling of canals when the pulp is destroyed and removed by intent. Under such conditions I can understand how cotton can be judiciously and successfully used. If, however, the subject embraces all classes of pulpless teeth, then I think Dr. Truman takes decidedly the proper stand. To make a sweeping assertion that the cotton treatment covers these numerous conditions of pulpless teeth is to admit either ignorance or indifference on the part of the operator. If the pulp is taken away what is the object of filling the chamber? There must be some reason for it, and now let us see if we can, in our imperfect way, throw some light upon the subject.

A tooth that has its pulp destroyed by intent, retains its dentine basic substance etc., all in normal condition, less the fibrillæ, which had their origin in the pulp, and die with the source from which they received their nourishment. No degenerate action further than devitalization having taking place, it is but necessary to remove the pulp, and render the adjacent parts in condition beyond contagion of a ferment, or the sequence of bacterial action; and to this end I can understand how cotton judiciously impacted can remain pure and protect the parts for an indefinite number of years.

If, however, we leave this class of devitalized teeth for those that have passed into a putrescent state, of greater or less duration of time, we have a very different condition upon which to operate. The dentine we find is composed of about twenty-four (24) parts of organic matter, the pulp a highly organized body of organic matter only; and the death of these tissues of long standing may be divided into two classes. The one opened from the onset to the atmospheric influences. the other hermetically sealed within the pulp chamber. In the latter case we have degenerate matter only —broken down tissue; while in the former we have in addition to that condition of things, all the complications of micro-organisms added to it. It is these two classes of conditions that give the greatest trouble in sealing up the canals. The dentine in either case has passed from a normal condition. In the case of the open cavity, we have the basis substance, in many cases, permeated by the conditions found in ordinary caries; the tubulated

structure encroached upon, oft-times the whole length of the tubuli being filled with fungus bacterial growth, in addition to inroads made into the basis substance itself; and the whole mass more or less a tooth garden of new life flourishing upon the inanimate tissue that is passing into waste. In the case where the tooth is sealed from external action, and the pulp devitalized, we have degenerate tissue only. But open these chambers to atmospheric and salivary action, and it will require but a few hours to place them in the same condition in which we find the cases just quoted. With these conditions it becomes necessary in the one case to remove the maximum amount of degenerate matter, and insure its inertness, and destroy all morbid growths found within the organ before the canal can be filled with safety. In the latter case it is necessary only to render the degenerate tissue inert, and prevent micro-organisms from gaining a lodgement therein. Now when we focalize the object in view in the treatment of these cases, it confines itself to placing the dentine in a condition of non-activity, or otherwise suspending the action of any influence that can become an irritant. To this end do we resort to antiseptics and germicides.

The greater or less length of time, in my judgement, has little to do with its success. The agent that will suspend or control all degenerate action has everything to do with the success, whether it requires minutes, hours or days. From clinical observance, general practice and theoretical investigation, this course of treatment holds good. When the pulp is destroyed by intent and carefully removed, the dentine thoroughly desiccated, and the chamber walls coated with some germicidal agent, the tooth may be successfully filled and the pulp chamber left vacant; or, the chamber may be filled with any material that will hermetically seal it. The two latter conditions, which are typically alike, require the dentinal territory to be thoroughly robbed of its resident moisture, rendering it sponge-like, which can be done by forcing into it through a system of compressed air, heated as hot as the patient can bear it, and carried to the most distant parts of the canals by platinum hair tubes, and followed, while in a condition of thorough dryness, with a germicidal agent that will permeate it to its peripheral surface, rendering the whole territory inert. The cavity may be filled with gold saturated with oxy-chloride of zinc, or any material which will hermetically seal it. Copper amalgam, into which is rubbed a small quantity of the following dressing, has, in my hands, given me the most satisfaction.

℞. Oil Peppermint ..... ℥j
Iodoform ..... } aa ʒss
Glycerine Starch ..... }

The dressing is easily carried upon a broach. The vegetable starchy matter, being in such small quantity, does not decompose, and makes it of a pleasant consistency for use. The oil of peppermint in combination with the iodoform is far-reaching and lasting.

Dr. Tees—For many years it has been my practice in filling single-rooted teeth easy of access, to pack a pledget of cotton saturated with carbolic acid in the apical portion of the canal and fill the remainder of the canal and pulp cavity with gutta-percha. In teeth of more than one root, I have been content to fill the opening of each canal with a pledget of cotton saturated with carbolic acid and filling the pulp cavity with gutta-percha. When this has been carefully done, and has been expedient in after years to remove it, the cotton has not been found offensive to the smell. I think it is well that the leading men of the profession are giving up gold as a canal filling. I regard oxy-chloride of zinc as an excellent filling for that purpose, and I endorse Dr. Truman's treatment so far, preferring, however, the placing of the cotton and carbolic acid in the apical portion of the canal.

Dr. Deane—I would like to ask Dr. Register if he cleans out the root of all its dead material?

Dr. Register—I strongly advocate cleansing out all the tissue from the root canal. At the same time I think the success is largely due to cleansing the mouths of the tubuli, and at the same time preventing any entrance of micro-germs. I think the success is in cleansing out the canal and preventing any degenerate condition.

Dr. Head—I would like to reply to Dr. Truman in relation to gutta-percha. He said that gutta-percha has a good record for preserving tooth structure. This I do not deny, but still affirm that it absorbs fluids and that, therefore, is an imperfect canal filling. Dr. Patterson's objection to my test in the glass tube is, of course, perfectly legitimate; but I think this test has been carried out more accurately than he supposes. Some years ago I came upon a tooth that had been thoroughly treated and thoroughly filled with gutta-percha to the end of the canal. There was an alveolar abscess, but the gutta-percha was permeated from apex to pulp cavity with gas. But in all this discussion no one has answered any of my questions. I will ask Dr. Truman, does not gutta-percha leak?

Dr. Truman—I do not think so.

Dr. Head—I leave his answer with you. Dr. Truman, does not oxy-chloride of zinc absorb fluid?

Dr. Truman—It does.

Dr. Head—Then, if oxy-chloride of zinc absorbs fluids, how can this material protect a sterilized canal from putrefactive germs? How can it possibly be called a perfect filling?

Dr. Kirk—The method described by Dr. Head of filling root canals with cotton, armed with carbolized carboline, is, in my judgment, not in any sense an argument in favor of cotton as root filling, but one in favor of *cosmoline*. The cotton is merely incidental, in the same way that it is often used in connection with oxy-chloride of zinc, viz.: as a vehicle for carrying to place the real filling material, which is the cement. Cosmoline is a heavy hydro-carbon oil, totally unalterable in air or moisture by virtue of its non-affinity for oxygen. It is sufficiently viscid to remain in the canal almost without the help of the cotton, which, in its relation to the cosmoline, fulfils the same function as the old root filling of gold saturated with gutta-percha filling.

In its general characteristics, a root filling of cosmoline and cotton would be very similar to that of paraffine, which is exceedingly valuable, and can be pumped in a melted state into the finest canal —with the advantage that when it is chilled and solidified it is denser.

The regular meeting was held Saturday evening, February 2d, 1889, at the hall Thirteenth and Arch streets. President Kirk in the chair. A paper was read on

IMPLANTATION SURGICALLY CONSIDERED.

BY RODRIGUES OTTOLENGUI, M.D.S., NEW YORK.

Whether the operation of implantation be destined to abandonment when we are enabled, if ever, to form a final judgment, or whether it will become a recognized practice, is not here to be discussed. In either case, it is however of much importance at present to those who undertake it, to possess a thorough knowledge of the anatomy of the maxillæ. To the inexperienced, who attempt to operate without such knowledge, there is a danger which cannot be overestimated. It is to be borne in mind that vessels are only approximately constant in their positions in the body. The surgeon cutting through soft tissues, is warned by his sense of touch, if he approaches a vessel slightly out of the expected position. With us, who drill into a bone, however, the conditions are different. In the superior maxilla the vessels do not pass through special channels, but readily penetrate the spongy bone. In the

inferior maxilla where the vessels are larger, there is, except in the incisive region, a special canal. This canal, however, has no dense wall which might give us warning, but is formed simply by a slight condensation of the bone, and retains in a marked degree the spongy appearance. The positions of the nares and antrum should be thoroughly appreciated. In order to gain a full insight into these matters, I obtained a number of bones, made sections in various directions, and what I learned from these and actual operations in the mouth, are the sources from which I draw the conclusions arrived at in this paper.

In an article on Replantation in the American System (Vol. II, page 372), Dr. Weld makes this statement: "Some practitioners have been in the habit of washing out the socket, and immersing the tooth in a solution of carbolic acid. There is no objection to this plan, provided the solution be not too strong, not exceeding 4 or 5 per cent. *But as antiseptic measures are hardly required in such operations, there is no particular reason for commending them.*" I introduce this here without further comment than to say that Dr. Weld, at one time an enthusiast on the subject of replanting roots and teeth, finally reported failure in a large majority of his cases, after a time varying from a few months to five or six years.

It is my purpose to consider the subject in strict adherence to its title, and I shall describe the operation as I deem it should be performed.

The patient having consented to the operation, the surgeon should first thoroughly wash his hands and clean his nails. I deem this of so much importance that I shall tell how to do it. A basin of water should have about three drops of ammonia added, and the hands should be steeped in this for at least one minute, and then thoroughly scrubbed with a hard brush, using castile or glycerine soap. The hands thus relieved of the main portion of stains and dirt, and the nails cleansed whilst still softened by the warm water, should nevertheless undergo a second washing and scrubbing exactly similar to the first, except that a hot solution of hydronapthol and water should be substituted for the ammonia water. Anyone who has not given the hands a treatment similar to this will be surprised and pleased at the result. In drying the hands a fresh clean towel should be used. Of course the assistant should pursue the same method. Next, as to instruments It is not necessary or advisable to place expensive instruments within the destructive influence of bichloride of mercury. A glass finger-bowl may be partly filled with hot water, and into this tablet of hydronapthol thrown,

producing a saturated solution (1–300), and into this all the instruments to be used should be placed and kept during the procedure, without fear, as this agent is germicidal in a solution one-tenth as powerful, and is non-corrosive. Into the same bowl I place small pieces of sponge, which I use for cleaning the socket of bone chips, a fresh piece being taken each time. In passing, I would suggest that it would be well for the bowl to be of a deep blue or red color, as the instruments thrown in during the operation dye the water, and render it unsightly to a patient of delicate nerves. For the same reason a spittoon should be used which conceals its contents, and should be cleansed as soon as the actual operation is over, that neither the sight nor the odor of the blood may be present. The napkins should be renewed frequently, clean ones replacing those which become stained. Strict attention to these seemingly trifling details does much to mitigate the shock of the patient.

As an anesthetic before making the incision through the gums, I use an ether spray. To those who at this moment are thinking of "sloughing" as an attendant evil of this method, I will say I have used the spray for minor operations about the mouth, opening abscesses, removing necrosed tissues, etc., and have never seen any ill result. I think this due to the fact that the spray is not pressed to the point where actual freezing occurs. With the Rollins tubular knife a circular incision is quickly and painlessly made, and the tissue thus isolated is dissected away with a bistoury. Next, the the socket must be formed. For this no anesthetic is needed. I use instruments of my own pattern for this purpose. I have ten different sizes, which enable me to choose with reference to the diameter of the root of the tooth to be inserted. Two sizes will be found necessary, the smaller, to drill the socket the required depth, and a larger, to ream the upper portion to fit the root. If the larger reamer is a trifle smaller than the diameter at the tooth-neck, the socket may be formed so that the tooth when placed will fit tightly. I have so placed teeth, and seen them worn with comfort, and become fixed without splint or ligature. It is safer, however, to use a splint or retaining fixture of some kind, as the teeth frequently loosen in a few days, though firmly placed at the time of the operation.

Special precautions are to be observed in forming the sockets in every case, as follows:

First—The Central Incisors, Superior.

A section through the center of the socket of the central incisor in the upper bone shows that the floor of the nares (the

inferior meatus), is not far distant, whilst just back of the palatal wall of the socket, and towards the median line is found a canal of considerable size—the anterior palatal canal. Danger of entering the nares is present in two conditions: First, where a tooth, whose root is too long, is used; and second, where there has been considerable absorption after extraction. In choosing teeth, the fact that a tooth in the hand has a crown which matches in size the similar tooth still in the mouth, should, by no means, be taken as evidence that the length of the roots are equal. In development of teeth, the length of their roots is in relation to the depth of the alveolar processes, whereas the width and length of the crowns may more probably depend on the space they must occupy in the arch. Hereditary influences also play an important part. The length of a root cannot be guessed at by the crown. In determining, then, the length, which would be safe, several points may be taken into consideration: First, observe the gum as to whether recession has occurred. If so, a tooth with a slightly longer crown than that of the one next the space, must be chosen, and the root should be just so much shorter. If the lip is turned up, a digital examination will frequently disclose the end of the neighboring tooth and measurement made. If this cannot be done, the line of union between the lip and gums may be considered a point beyond which it is unsafe to drill. In relation to the palatal canal, the direction is an angle slightly greater than the slant of the centrals in position. Generally these two canals are quite close together, or united at the junction of the two bones; but in some specimens, especially from young persons, they are larger and more widely separated. There is a condition frequently seen where a space exists between the central incisors, the frænum continuing down on the gum as a well-marked ridge, ending in a little pedicle, which drops between the teeth. If one or both of these teeth should be lost, and the patient desires implantation, no attempt should be made to fill the space by making the socket (or sockets) near the median line. Such a course would surely result in entering the canal and rupturing the vessels, for the canals are widely separated in this somewhat abnormal condition. Great care should be observed with children —I have inserted a tooth for a boy ten years old to replace one lost by an accident—because the canals are very large at the age of five, being about double the adult. I have seen a skull, with the tempory teeth still *in situ*, where the foramina of these canals were three sixteenths of an inch in diameter. The mere sight of that bone would make an operator redouble his precautions in future operations.

SECOND—THE LATERAL INCISOR.

In drilling a socket for a lateral incisor, the operation is in less dangerous territory, the distance to the nares being greater, and no large vessels being near. There is, however, one point which it is well to remember, viz., that extreme care should be taken not to drill through the alveolus at the extremity of the socket at the palatal aspect, thus wounding the soft tissue which covers the roof of the mouth. Of course this is an accident to be avoided in all instances, yet I think there is special need for caution with this particular tooth, because whilst I have no proof I have abundant evidence which tends to indicate that an idiopathic tendency to pathological disturbance exists in this specific region. This of course is dogmatic, but caution is never hurtful. In the absence of direct proof, I will simply ask if the gentlemen present have not noticed the more than proportionate frequency of alveolar abscesses in connection with this tooth, and the stubborn persistency of the disturbance when once present; the rarity of success in efforts to conserve even slightly exposed pulps, and the rapid inflammatory action and loosening of the teeth after the death of the pulp? In my own experience I have seven times observed a detachment of the soft tissues from the palate process by the burrowing of pus, in three instances in defiance of the fact that fistulæ existed at the labial aspect of the alveolus. In another instance, almost the entire palatal process was destroyed as far as the median line, by solution of the lime salts from the bone. And in yet another a similar condition of less extent was reported by a brother dentist, in which case apparent restoration to health would result from treatment, the discharge of pus recurring persistently, however, for ten months at each menstrual period. It may be entirely a coincidence, but these nine cases were all in connection with the lateral incisors.

THIRD—THE CUSPIDS.

The cuspid socket normally is immediately under the apex of a triangle of which the wall of the antrum forms one side and that of the nares the other. The distance between the socket and the roof of the mouth is also greater here. A glance at sections of the bone, whether made through the socket towards the palate, or through all the sockets of the bone, shows plainly that this is the safest region for the operation. A point of interest, however, not to be overlooked is the fact that in this territory only do we find vessels of sufficient size to require special canals. I have found

canals, two in number immediately over the apex of this socket, and nowhere else in the bone. They are short, however, and cannot be followed far with a bristle. The nerve comes down from the region of the antrum, and immediately over this tooth divides into anterior and posterior dental. In selecting teeth for this part of the mouth we should not choose too long a root, for in making a socket sufficiently deep we might wound one of these nerves, as I am sure I did on one occasion, producing a neuralgia which persisted twenty-four hours, and disappeared only on the exhibition of antipyrine in large doses. An arteriole might be met here, which if injured would, in one of hemorrhagic diathesis, produce unpleasant, if not serious results.

FOURTH—THE BICUSPIDS.

These teeth may be considered together, for the antrum, the point of danger, is sufficiently near in many cases even to the first bicuspid, to make the precaution which should be observed in making sockets for the second bicuspid equally necessary in cases where the operation is for the first. The bicuspids are the teeth we are most frequently called upon to insert, and are also the ones offering the greatest danger of accident. It frequently occurs that, though the adjoining teeth are still in position, the absorption of the alveolus is so great that if the original tooth could be found and replaced, a considerable portion of the neck of the tooth would be exposed. When it is remembered that this loss of tissue shortens the distance to the antrum, originally none too great, the selection of a tooth to occupy this place becomes an important consideration requiring mature judgment. As it is claimed to be impossible to judge of the root of a tooth by its crown, so, also, is it equally difficult to locate exactly an antrum by examination of different skulls. The cavity is most variable in size, being sometimes large in small bones and small in large bones. There is, however, a comparatively safe course to take in the diagnosis, and that is, that the antrum has the largest possible dimensions. This would mean that the floor extended over the entire molar and bicuspid region, the lowest point being over the second bicuspid. The landmarks and their value are as follows: The junction of the cheek and the gum is usually on a level with the floor of the antrum. The molar process, easily discoverable by a digital exploration, forms one floor of the antrum, though not the lowest; the extreme base of this prominence may be taken as a point beyond which it would be unsafe to drill, and measurement may be made accordingly.

In performing the operation the patient should be tipped back so that the height of the roof of the mouth may be well considered, as also the width of the process; this latter point will give an idea as to how much towards the palate the drilling instrument may be deflected in order to avoid the antrum, which is mainly in the buccal portion of the bone, but in this effort to avoid one danger another should not be overlooked; in so slanting the instrument there is a chance of entering the nares, especially in the case of the first bicuspid. It should be borne in mind that should either of these cavities be entered and a tooth implanted notwithstanding, as has been advised by good operators, diagnosis would be difficult should any after-trouble occur. In either case a discharge would find its way into the fauces, dripping from behind the velum. One more point, and then I shall relate an incident which will emphasize the fact that these precautions are worthy of note. After a tooth is extracted, the socket is usually filled with a deposit of new bone. It becomes a question of importance whether this bone be dense or not. In some, and perhaps the majority of cases, the new bone is about the same as the surrounding parts. In other cases, however, and these are the ones fraught with special danger, when working under an antrum, the socket is filled with bone abnormally vascular in character, the surface, however, being a dense, hard layer. In operating in such a case, the outer and denser layer would offer such resistance that great force would be required to penetrate it, and this accomplished, were the operator not prepared against accident, the instrument would rush forward through the less resistant spongy portion. In order to exemplify this, and to disprove the assertion made by a skillful operator in a paper read last summer, to the effect that no serious consequences might be expected from entering the antrum, I will insert here the history of a case in which occurred most untoward results.

At the clinic before the First District Society of New York, last winter, I implanted a first bicuspid for a lady patient. I found the bone at the surface very resistant. I was using the Walker-Younger trephine, and had the little collar set to indicate the depth to which I had decided it would be safe to drill. I wish to emphasize the fact that it was for a *first* biscupid for which I was preparing a socket. I exerted considerable pressure in entering the bone and was, nevertheless, progressing slowly, when suddenly, to my amazemet and dismay, my instrument plunged forward, entering the bone beyond the depth marked by my collar, and became

so wedged that my engine was stopped. I had considerable difficulty in withdrawing the trephine, and a flood of blood followed. A spittoon was furnished, but my patient continued ejecting blood so long, that I brought her head back into position and attempted to wash the parts for an examination. This was done with difficulty, as the flow of blood was quite continuous. It last, however, it was staunched sufficiently by packing the cavity with cotton, so that the mouth and face could be washed, and then, on withdrawing the packing, as the flow began again, the nature of it was determinable, and from the distinct pumping, I concluded that it came from an arteriole. I again packed the cavity, as the flow threatened to be great, and with a careless word to those about me, none of whom suspected the gravity of the situation, knowing neither that the antrum had possibly been entered, nor that a vessel had been lacerated, I whispered a word of encouragement to my patient, and turned away to seek advice from friends present. One of great experience returned with me, and watched the flow as I removed the packing a second time. He advised the rapid completion of the operation and setting of the tooth in spite of the hemorrhage, which was really alarming. In deference to this advice, I finished my operation rapidly and placed the tooth in position, procuring a fine adaption and perfect occlusion, and winning encomiums from all present, except myself. I received the applause accorded me with a heavy heart and a sore conscience. Fortunately for me, the patient was my own sister, and would be under my constant observation. Before placing the tooth finally, I essayed to probe the socket, in order to determine whether the antrum had really been penetrated. I could find no opening, but touched a point which was so very sensative, that I had little doubt that it was a nerve. The exploration also brought a recurrence of the hemorrhage, and for this reason was not thorough.

The first night an increasing pain was present, reaching such a point by midnight, that I deemed it best to administer twenty grains of chloral, which, from an acquaintance with the idiosyncracies of the patient, I knew to be the safest remedy. This brought sleep in about one hour, and she reported at my office the following afternoon. At that time the pain still persisted, and she complained of a slight but constant trickling of blood in the throat. An odor of blood also began to be noticeable. That night sleep was obtained without recourse to narcotics, and my own mind became somewhat relieved.

On the third day the patient reported at my office in the morning. Locally all seemed progressing well; but the dropping of

clotted blood from behind the soft palate was still present, and the odor had so much increased that a spray of carbolized water was used, and directions given that it be kept up during the day. The neuralgic pain from the lacerated nerve still continued, and antipyrine was ordered in doses of five grains every hour. As the patient seemed cheerful, I kept an engagement previously made for that evening, and did not reach my home in Brooklyn till midnight. I found my sister awake and anxiously awaiting me. The dripping into the fauces had become purulent to a slight degree, and though the antiseptic spray had been strictly adhered to during the day, the oral cavity emitted an odor disgusting even to the patient. She was in a high fever, the temperature being 102°, and the pulse 100, the normal pulse in her case being as low as 70. This fever continued, notwithstanding the administration of the antipyrine, which had produced no salutary effect whatever, the pain having greatly increased. Under the circumstances I deemed it best to remove the tooth, which was done gently with the fingers. The immediate result was a great intensification of the pain; but chloral produced sleep in about three quarters of an hour.

We arose about seven o'clock the next day, and called on a throat specialist. My intention in so doing was to have him make an examination, in order if possible to discover whether the dripping into the throat came from the antrum or the nares. I remembered that, in order to accommodate the occlusion, I had slanted my trephine towards the latter cavity. We reached the office of my friend before he had arisen, and whilst awaiting him, my sister lay on the lounge. In about five minutes she arose, saying that blood was coming from the *socket*. I at once took her into the office, and sent a messenger to hasten the doctor, as I knew not where he kept his appliances. This secondary hemorrhage assumed the most alarming proportions, the flow being continuous for half an hour, in spite of our efforts to control it, which was finally accomplished by packing the socket and then forming a roll of cotton on which she could bite, thus making a compress. The actual flow having ceased, we allowed her to rest on a lounge, whilst the doctor attended to his patients, who began to arrive. For two hours, in spite of the packing and the compress, sufficient blood oozed through the dressings so as to make the presence of a spittoon necessary.

At the end of three hours we returned to the specialist's office. Cocaine was applied to the nose and the cavity dilated. A thorough examination was made, both ocularly and with instruments; but no evidence that the discharge came from the antrum was

obtainable. Instruments wrapped with cotton could be passed through the passage and withdrawn free from any stain of blood. So long as the hemorrhage had continued the dripping into the throat had ceased, as also had the pain; both had recurred with the packing of the cavity. All the unpleasant symptoms continued during the day. The spray was changed to one of listerine, as being less dangerous to the mucous membrane; the packing in the socket was left in place, and specially sprayed to keep down the offensive odor.

On the morning of the sixth day (two days later), the patient awoke to find that the packing had slipped out of the socket during the night, and as the hemorrhage had not recurred it was left out. That afternoon she was able to come to the office, having been confined to bed for two days, suffering from nervous prostration and pain. As the discharge into the throat was now distinctly pu, in spite of the danger of renewing the hemorrhage, a gold probe was passed into the socket, in the hope of determining whether the antrum was involved. The probe passed into the antrum unobstructed, and all doubt was dispelled. No serious result followed this probing, although slight hemorrhage occurred that night, which the patient herself readily controlled by packing the socket.

The question arose as to what was the best method of procedure, and in this affair I felt myself irresponsible, the nervous strain on myself and sleepless nights having completely unmanned me; I therefore called in a friend in consultation, and we discussed the propriety of placing a tampon in the opening to the antrum, so that that cavity might be thoroughly washed out. We determined that this would greatly aggravate the pain and delay the healing; that so long as the cavity was being emptied by the dripping behind the soft palate, the danger of septicemia would be absent, and therefore such heroic treatment not indicated. The course decided on was to use antiseptic sprays in the mouth and nares, and wait. If the dripping should cease and the temperature rise coincidently, interference would then become necessary.

This treatment was followed, and a cure effected. The pain, however, continued for fifteen days after the operation, the dripping of pus continuing for thirty days, and a complete restoration occurring in about five weeks.

Undoubtedly the hemorrhagic diathesis in this case contributed greatly to the disastrous results of what, after all, was but a simple wound. There could scarcely be an accusation of septic taint, as the strictest germicidal treatment has always prevailed in my

operations. It was only the eighth day after the operation that I was, by appointment, to give a clinic at Newburgh, and my feelings during the operation may be imagined. The case was the implantation of two central incisors, in a space much too wide, and the dentists about me endeavored to persuade me to close up the space at the median line. I had too lately had an experience of hemorrhage, however, to approach the palatal canal, and set the teeth, as the original ones had been, with a space. I think the relation of this case should tend to make operators careful, especially where there is a predisposition to hemorrhage.

FIFTH—THE MOLARS.

Of molars there is little to say. The usual precautions are necessary, especially as to the antrum. I generally use wisdom teeth which have a single root, or convergent roots, or possibly a lower molar, but never a three-rooted tooth. I make a single socket, not a socket for each root.

In the *lower jaw*, all the general and a few special precautions are necessary. The point of danger is the presence of the dental vessels, which occupy a large canal, the locality of which should be specifically known. A section through the centers of the sockets, which removes the lingual portion of the bone, discloses the fact that the dental canal would thus be reached only in the bicuspid region. A section, however, which removes the buccal portion exposes the entire canal. The point of moment to be gathered from this is, that the canal exactly underlies the teeth only in the bicuspid region; in the molar region it curves outward, and occupies a position in the swell of the bone. Between the bicuspids the canal divides, one branch curving outward, reaching the surface at the mental foramen; the other continues, but is no longer a definite canal when the cuspid is passed.

FIRST—THE INCISORS.

The incisive region, in the lower jaw, is *comparatively* safe. It must be remembered, however, that whilst there is little danger to be apprehended from drilling deeply, much care must be exercised in lateral reaming, as the alveolus is narrow, and, here as elsewhere, the aim should be to surround the implanted tooth with bony rather than with soft tissues. The amount of tissue lost from absorption, caused by salivary calculus, should be carefully estimated in deciding the depth to which the drill may be carried. In fact, the aim should always be to carry an artificial socket no deeper than was the original one.

SECOND—CUSPIDS.

Under the cupsids be it remembered, the dental canal, though smaller than elsewhere, is nevertheless distinct.

THIRD—BICUSPIDS.

In connection with these teeth it should be borne in mind that the main canal is immediately beneath the original sockets, and that a branch passes between them. A socket for a first bicupsid should be drilled towards the cupsid, and one for the second should be directed towards the molar. The depth to which the drill may be carried should be most carefully calculated.

FOURTH—MOLARS.

It having been shown that the canal, quite large in this vicinity, curves outward towards the cheek; it would be safer to slant the drilling instrument lingually, rather than straight down or outward.

In passing this aspect of the subject, a few more cautions may be noteworthy. I can conceive of no condition where it would not be reprehensible to endeavor to implant a third molar, especially in the superior jaw where there would be danger of wounding the artery which passes around the condyle, the superior dental, or the descending palatine, within the posterior dental canal.

The arteries which supply the teeth are larger in the lower than in the upper jaw. In the latter, within the bone itself, are the inferior dental which, under the bicuspids divides, the mental passing out at the foramen, and the incisor continuing under the anterior teeth, till it anastomoses with its fellow. In the superior maxilla it is otherwise in that the branches of the superior dental, which enter the foramina of the bone to supply the teeth, are too small to be given distinctive names, but are still large enough to make considerable hemorrhage possible, as has been related. We do not trace back far before we reach important vessels, the superior dental being a branch of the alveolar, which is given off by the internal maxillary, the most important branch of the external carotid.

Absorption in the lower jaw is usually so great, that the original distance between the dental canal and the surface of the bone is materially lessened. Except where but one tooth is absent it would be imprudent to operate without special consideration of this fact. For example, suppose a case where the bicuspids and molars have been lost on one side; the implantation of a molar would render a bridge possible; but where so many teeth had been lost it would

be very improbable that sufficient alveolar process would be remaining above the canal to render the operation possible. If such a bone be examined, even the mental foramen will be seen to be almost at the surface.

The socket made, it remains to place the tooth in position. Before this is done, all bone chips should be thoroughly removed, pieces of sponge being used; one piece saturated with hydronapthol solution being left in the socket, whilst the operator once more thoroughly washes his hands and sterilizes them. In the final placing, the fingers which insert the tooth, and the tooth itself should be wet with the potassio mercuric iodide solution. A piece of orange wood and a few taps of a mallet may be used on occasions to set the teeth home.

I prefer the splint to the ligature for retaining. A permanent splint is made of gold, swedged to form a continuous crown and backing over three teeth including the implanted one. This is fastened with oxy-phosphate. A removable splint is made of vulcanite and covers the roof and passes over the cutting edges of three teeth as before. This worn continuously at first is, after a while, worn only at night, to prevent accident during sleep. In cases where the patient can be seen often the latter splint will be found preferable. Impressions for these are made with plaster immediately on completion of the operation. The plaster is watched closely and removed in such a way as to fracture at the cutting edges, leaving the portion which covers the face of the teeth and the gums, to be removed afterwards. If done carefully there need be no fear of disturbing the tooth implanted.

DISCUSSION OF DR. OTTOLENGUI'S PAPER.

Dr. James Truman—I am much pleased with the course that Dr. Ottolengui has taken in treating the subject, because I think it is high time that the dangers in performing this operation should be considered. In the cases illustrated, he shows distinctly how necessary it is to be careful. In some of the operations I have witnessed there has been a degree of carelessness exhibited, and I have contended that sooner or later there would be trouble caused by penetrating the antrum. I am only an observer, never having implanted a tooth; therefore I cannot discuss the subject. Dr. Kirk has had a large experience in implantation, and we should be pleased to hear from him.

Dr. E. C. Kirk—I am glad to have an opportunity to say a word upon implantation, particularly after such a good paper as has

been given us. There can be no doubt that precaution should be observed from the beginning of an operation. I have observed a course somewhat different from the one described in the paper, because, I have relied exclusively upon bichloride of mercury as a disinfectant for instruments, socket, hands, etc. The case which he presents is very interesting. Some think that the mere penetration of the antrum will produce great inflammation. I do not see why it cannot be entered without so much danger. The case cited to-night is peculiar in itself. In the first place, he had a patient of marked hemorrhagic diathesis. In the second place, he not only opened the antrum, but injured an arteriole. The antrum was full of blood. Following this he closed the opening, and yet he maintains that he kept up antiseptic treatment. The history of the case proves, that no matter how well directed his efforts may have been, he did not succeed in it, because he evidently had a case of septicæmia, followed with purulent discharge. He could not thoroughly inject into the antrum and wash it out, because he was afraid of increasing the pain and causing a return of the hemorrhage.

I have been anxious to find just such a case, because we who believe in the operation are constantly having practitioners predict trouble. Dr. Ottolengui has shown one case where we may have difficulty—in a patient of hemorrhagic diathesis. After rupturing the arteriole and filling up the antrum with blood, to put in the tooth, and thus allow putrefaction to take place, was not good practice. In using a spear-pointed drill, I carry it with extreme caution to the depth I want the root. In drilling slowly, suppose you do make a perforation, any dentist can tell in opening any cavity when he runs into the pulp chamber. The cut of a spear-pointed drill in this manner cannot be productive of harm unless in such a case as Dr. Ottolengui cites, which is followed by excessive hemorrhage. In a majority of the cases I ligate the tooth in position; I do not use silk or linen ligatures, but prefer the one suggested by Dr. Farrar in retaining teeth—soft annealed brass wire, No. 31. I have used it repeatedly for that purpose, and when implanting, use it for holding the tooth in position. It does not corrode, and is without any irritating effect upon the gum and soft tissues. It has given entire satisfaction, and I have used it almost exclusively. In some cases, when I first practiced implantation, I used silk ligatures; but they were not as satisfactory in any way as the brass wire. During the time of repair and healing, antiseptic measures are kept up by using phenol-sodique as a mouth wash.

Dr. Ottolengui—Dr. Kirk comments upon the insertion of the tooth under the existing circumstances. I was advised to take the tooth out, although when I put it in the hemorrhage stopped. The packing had to be put in with considerable solidity, because the blood would not clot without doing so, and when it finally stopped flowing externally, it still oozed into the antrum.

Dr. Kirk may be right when he asserts that there is no trouble to be apprehended in opening into the antrum, but he must remember it is not an ordinary cavity. It is one in which the opening is at the top; fluids cannot escape until it is two-thirds full, when they flow into the nares; it is important to avoid puncturing it, because in the passage you may rupture some vessel that will pour its contents into it. There is a difference in opening into the antrum in disease and drilling into it in implantation. In disease, there is a diseased root that is first removed, a long socket exists and only a little bone is removed. In drilling a socket into the new bone it is different. This not only has arterioles in it, but it is filled with blood, and to rupture a vessel gives rise to a possibility of the blood pouring up into the cavity.

My instruments are a combination of the drill and the reamer. They have nine leaves to them, and only three go to the top. It is very much simpler to use a construction that will not only drill the depth you want, but also do lateral reaming. It makes a difference whether the operation is performed in one hour or in a few minutes.

Dr. James Truman—I am sorry it was necessary for Dr. Kirk to leave. He did not seem to think the hemorrhage was a matter of any great importance, that it could have been readily controlled, and that the placing of the tooth was a wrong measure. This may have been true, but what was he to do about a hemorrhage of that character? It was necessary to have some pressure upon that arteriole to stop the hemorrhage and produce coagulation. In that case he would necessarily force blood into the antrum, which would become decomposed. I do not see how it could be possible to keep the cavity open. I do not think we can penetrate the antrum with impunity. If we do so there will be irritation, and inflammation will be set up in the lining membrane and the development of micro-organisms. If there is no harm in opening into the antrum, and no possibility of evil, then I have not learned my lesson well.

Dr. Ottolengui—One thing seems to have escaped Dr. Kirk—that the blood came from the lining membrane itself. It would be

difficult to get a compress up there to stop the bleeding, even if the character of the blood was such as would readily coagulate.

Dr. James Truman—I wish to express my gratification, not only for the paper, but for the kindness of Dr. Ottolengui in presenting the Society with these illustrations, which show very clearly the danger of this operation, with the possibility of trouble, and other facts in connection with it, and I wish to offer a resolution that the thanks of this Society be offered the Doctor, not only for the paper, but for the kindly presentation of the pamphlets.

Subject passed.

Dr. Head then presented some new points in relation to root filling.

Dr. Jos. Head—In my paper of last month I asked some questions at the end which were not, to my mind, satisfactorily answered. They were as follows:

Does not gutta-percha leak when used for filling canals?

Do not oxy-chloride of zinc and phosphate of zinc leak when used for filling canals?

If they leak, do they not place the tooth in danger of alveolar abscess?

Do not these leaky substances make a harbor for germs of of putrefaction?

And, lastly, cannot a thoroughly water-tight antiseptic stopping be made with cotton soaked in a 30 per cent solution of carbolized cosmoline?

It was said by Dr. Truman that gutta-percha, when used as a canal dressing, in his opinion, did not leak. My experiment with glass tube tests, which I admit are very crude tests, was criticized on the ground that the glass expanded. It was not denied that oxy-chloride of zinc would absorb moisture. One gentleman, a visitor, advised me to take a glass tube drawn down at the end to the size of the apical foramen of a tooth. This, when filled with gutta-percha, he said, would exclude moisture for months. I did not carry out his experiment, as the unequal expansion of the glass and gutta-percha again could have been brought forward. I concluded to set aside all unnecessary complication by taking natural teeth—three, and opened into the canals and filled them much more thoroughly than it could be possible to do when situated in the mouth. After cleansing the canals by careful drilling into one of the teeth, warm gutta-percha was inserted until it streamed from the apical foramen. The other two teeth were respectively filled with oxy-chloride of zinc and

cotton soaked in carbolized cosmoline. The holes in the crowns of these teeth were then filled with gold. Having operated on these teeth January 7th, I dipped them in a solution of analine ink. They were removed on the 1st of February, having been submerged just twenty-four days. I then laid bare the canals, and here they are, gentlemen, for your inspection. I think you will all perceive that the gutta-percha has not only leaked, but even its surface, to a slight degree, has absorbed the ink. The oxy-chloride of zinc is permeated with ink, while the canal guarded by cotton and carbolized cosmoline is absolutely intact.

The cosmoline has also permeated the structure of the dentine, making it water-tight and antiseptic. But the chief merit of this filling lies in the fact that it can be readily removed. It has been said by my friends that I do not fill teeth with cotton, but fill them with cosmoline. And yet, in the same breath, they assert that I sometimes fill teeth with cotton and carbolic acid, objecting to this practice on the ground, that the carbolic acid evaporating, leaves the cotton ungarded.

Why do not they say that I fill teeth with carbolic acid only? It would be just as logical. They must know that the cotton acts as a vehicle for holding an antiseptic. No one, at the present day, thinks of using it unguarded. Cotton, when saturated in cosmoline, renders venting of the canal much more easy of accomplishment than when cosmoline alone is used.

The great advantage cosmoline has over all other medicaments, lies in the fact that it readily permeates the entire structure of the tooth, thus rendering the tooth water-tight.

Dr. James Truman—Cosmoline as a filling material may be indestructible; if you can work it into a canal. I have not the slightest question but that it would make a good filling; and if a few fibres of cotton go in, it will be good. My controversy was in the use of cotton and carbolic acid. I said that carbolic acid would eventually lose its power in the root canal, and that it would leave a very good field for micro-organisms. Dr. Head has taken the precaution to use cosmoline. I have no controversy with that. I do not know from any experiment that it will preserve teeth. I take his word for it, and I believe it is possible to be used; but I would like to have sections made of these teeth which he presents, and examine them under the microscope. To be sure, it looks as if the teeth have leaked; but I would prefer, as a positive test, before deciding the question, that they be made up into sections, and then be carefully shown under the microscope.

Dr. Head—Dr. Truman has nothing to say against cosmoline. Then let us lay that aside. He says that he has something to say against cotton soaked in carbolized cosmoline. The specimens which I have just shown to you show that oxy-chloride of zinc and gutta-percha absorb moisture. What more can cotton do? He finds fault with cotton, and yet approves of oxy-chloride and gutta-percha. I should like Dr. Truman to tell me in what way oxy-chloride of zinc and gutta-percha are superior to cotton. Cotton is not only easily removed, but is also capable of holding an antiseptic. Oxy-chloride of zinc and gutta-percha do *not* hold medicaments. But, perhaps, some one of you will say that oxy-chloride of zinc is in itself an antiseptic. I think anyone who has smelt any oxy-chloride filling that has been in the mouth for six months will hold an entirely different opinion. Such a filling, when examined, will be found to contain gas sufficient to make half a dozen alveolar abscesses.

Dr. Chupein—I have used carbolic acid or creosote and cotton for thirty odd years, and I have never been able to see that the practice has been detrimental to the salvation of the teeth, the canals of which have been filled in that way. Dr. W. H. Trueman filled canals for a great many years in that way. At a meeting of the Pennsylvania Association of Dental Surgeons, he said he had been using gutta-percha. I asked him if he had gone back on cotton, he said " No, but I have been experimenting in deference to the opinion of others." I have used cosmoline with cotton, but have not had experience enough to say whether it is more favorable.

Dr. D. N. McQuillen—For five years I used cotton a great deal in canal filling, and had a number of abscesses. During the past five years, have not used cotton as a permanent filling, and have had a different experience.

Dr. Head.—In my paper, I said that it is not sufficient to fill the tip of the canal with cottton, the root should be filled with cotton up to the pulp chamber.

The great objection to gutta-percha lies in the fact that when a tooth is filled with this material, should inflammation arise, the patient is almost to a certainty compelled to undergo the pains of alveolar abscess.

With cotton this difficulty does not arise, as its fibres can be readily removed. When, of course, the tooth being vented, the gas escapes and the patient is relieved.

Dr. Ottolengui—We, in Brooklyn, have been converted by Dr. Van Wert to his method of filling root-canals. He uses:—

℞. Iodol ..... ʒj
Oxide of zinc ..... ʒij
Cosmoline ..... q. s.

Make into a stiff paste; it requires dexterity to make it so.

We fill canals with it, and we do not have any abscesses.

Dr. Head.—While that makes a good filling, it does not, in my opinion, make a better filling that pure carbolized cosmoline. I did not say that the principal use of cotton was to act as a vehicle. The chief advantage is that the filling can be easily removed, thus saving the patient from alveolar abscess.

INCIDENTS OF PRACTICE.

Dr. B. F. Place—I extracted a number of upper and lower teeth for a lady, about thirty years of age. The lower teeth were badly decayed and diseased. The lady went away without any trouble; the gums healed up nicely; but two months afterwards, she complained of a great deal of pain in the upper and lower jaws. Whenever she exposes herself to a draft of air or goes out, she has great pain along the zygoma, and often there is some slight inflammation, more on the left than on the right side. I was inclined to believe that there might be a small piece of root remaining; but I was careful in removing them, and know there was no sign of foreign bodies there, except a small piece of the process, which had been imbedded in the gum, and which I removed. She complained of pain, which at times, is better than at others. The soreness is more on the left side than on the right. She has not had any teeth in. I thought possibly that it might be some trouble with the nerves, and I would ask the opinion of the gentlemen here.

Dr. S. E. Gilbert—I have the models of a couple of cases of irregularity which I have corrected. The first is that of a young lady of twenty years of age, where the left superior lateral is thrown inside of the arch and overlapped by the central incisor; the inferior teeth closing over its labial aspect. To correct this, I used a "cross-bar," as described and illustrated by Dr. Shaw, in April Cosmos, 1888, page 215. The correction was accomplished in eleven days, causing very little soreness. The retaining fixture consists of a very thin platinum band (made to fit the tooth), with a cross-bar soldered to it, so that it rested against the labial surfaces of the adjoining teeth. This fixture was cemented to the tooth and allowed to remain.

The second case is that of a Miss of fifteen, and as you will see by the cast, the superior incisors are very prominent, so much so, that the lips could not be closed. This was corrected by means of a vulcanite plate, made to fit close to the molars and covering the palatal surface of the mouth. A rubber ring cut from small french tubing was fastened to the centre of the posterior part of the plate, and a silk ligature passed through the ring, the plate placed in the mouth and the ligature drawn forward, passing it between the centrals and tied over a cross-bar of wood. The tension brought to bear by the stretching of the rubber ring soon moved the teeth backward and into place, as shown in cast No.2, which was taken after the case was completed. The improvement in the features is very marked.

The regular meeting of the Odontological Society was held Saturday evening, March 2d, 1889, at the hall Arch and Thirteenth Streets. President Kirk in the chair. A paper was read on

CONDITIONS WHICH PROMOTE OR RETARD THE PROGRESS OF DENTAL CARIES.

BY C. N. PEIRCE, D.D.S., PHILADELPHIA.

The pathological condition designated "Dental Caries" is certainly one of the most frequent and most serious affections to which the teeth are liable, and educated dentists are all united in characterizing it as a "progressive and often continuous softening from the exterior to the interior of the crown, until a larger portion, or the whole of the tooth affected has gradually disappeared." Much of the labor of the dentist is employed in more or less successful efforts to modify, or arrest the progress of this destructive disease, and to restore as far as possible the ravages it has made in the organs under his care.

To do this intelligently, and with the most favorable results, many things are to be comprehended, and their influence appreciated and wisely heeded. If we attempt to tear down or disintegrate any structure, organic or inorganic, this labor is facilitated by a knowledge of the tissues or molecules of which it is composed, and of the manner of construction; so, also, if the attempt be made to stay or modify the influence of the antagonisms of its environment, the same knowledge is helpful to the success of such efforts.

In pursuance of this thought, first to be recognized, are the facts that in the segmentation and aggregation of living cells, primitive integuments are formed, and from one of these the tooth germs have their origin, and that the processes through which this

germination takes place are always liable to modification by the *interruption of nutritive distribution.* Histologists note also, that the impulse which establishes the individuality of the tissues, as well as that of the organ, must be given to it while in this immature and plastic condition, and that now also must the laws controlling heredity and adaptation to function, exert their morphological or formative influence, and through these and the nutritive currents, must be evolved the differentiated structures resulting in the ameloblasts, odontoblasts, and other tissues which are so essential to the development of the complex tooth.

After months of vital activity and continuous change, what were simple homogeneous cellular structures, become complex heterogeneous tissues, and efforts at specialization have resulted in a dissimilarity preparatory to a most remarkable process of solidification. In this latter process, the previously mentioned ameloblasts and odontoblasts (specialized cells only), in their functional duties have produced structures marvellous in density and (with aided vision) in beauty; and when these are normal in shape, and continuity, they are unequaled in their power of mechanical resistance by any other organic structures.

The morphology of the individual enamel cell, fiber or prism, is not arbitrary, or the result of a whim or accident, but a mechanical necessity, essential to the density of the structure. What other shape but hexagonal could they be to make a compact and solid structure of normal shape and size? Who would not recognize the spaces in a bundle of cylindrical bodies, however tightly they may be bound together? And, if brought under pressure sufficient for solidification, the hexagonal shape must most nearly be approximated in the individual integrals. The crown of dentine, upon which these enamel cells rest, with the line of their axis almost vertical to the coronal surface, is not a plane in any sense of the term, but is made up of wavy or irregular elevations and depressions, and upon this uneven foundation these cells must rest, varying in the line of their perpendicular position, and in their density, the latter quality being in correspondence with their near or remote position regarding nutritive supply, and *their previous, as well as their prospective, functional activity.* The normality of this enamel tissue, with its maximum resisting power, is dependent largely upon the general or systemic condition during the period of its development and calcification. Its vices of conformation and pathological predispositions, which make this tissue an easy prey to an acid environment, are exhibited in a want of continuity of the

cells, and an imperfect calcification of the same, inducing pits and ragged or roughened depressions, all which are factors in dental caries, through their power of absorbing, and retaining in contact with the tissue, a destructible agent; hence it is of the utmost importance that the influences of these possible conditions should be recognized and appreciated.

The dentine structure, possessing a much larger per cent. of organic matter, is necessarily, by virtue of this, less dense than the enamel; and though originating like the enamel from a homogeneous cellular germ, it is evolved only through a multitude of progressive changes, culminating in a double layer of highly specialized odontoblastic cells, and their conspicuous prolongations, covering the coronal surface of the plastic mass, known as the dentine matrix or papilla. These odontoblastic cells are recognized to be the final effort of the plastic cellular mass, previous to the depositions, or secretions, of the salts of lime; and to be themselves the active agents in the elimination of the mineral substance which forms the tissue known as dentine.

The dentinal portion of a tooth is of the three dental tissues the most constant, and yet the most varied in its histological development, displaying structural peculiarities in the same species, and marked differences in different species. It affords the solid foundation upon which the enamel fibers rest, and conveys to them about all the nutrition and sensation they possess, after the tooth crown has once been thoroughly deprived of its vascular covering by complete eruption. Indeed, it is the only medium through which the enamel can have any arterial or nervous connection, after it has passed through its enveloping sack and the gum, except the little it may receive through the thin margin of cementum, with which it comes in contact on the neck of the tooth. The tubuli, which permeate the dentine, and open with their largest diameters upon the pulp chamber, giving an impetus to the ingress of fluids, are, when the tooth is in normal condition, a source of strength and nutrition; but when the organ is attacked with caries, they become a source of weakness, and facilitate its decalcification and the subsequent decomposition of the organic matter which has served as a matrix for the inorganic. The dentine, like the enamel, is liable to imperfections, or structural defects, from disturbed or mal-nutrition, a sequence of constitutional abnormalities. These defects may be slight or serious, varying with the severity or duration of the disturbance.

They may consist of masses of semi-calcified dentine, or of cells or spaces known as "interglobular spaces," distributed throughout

the body of dentine; though they are more frequently recognized near the zonal line, between the enamel and dentine, which makes them more important factors in favoring decay. The infolding upon themselves of the terminal ends of the tubuli, and the more frequent diseases of childhood, are probably two of the causes to which this appearance or condition may be attributed.

These recognized vices in structure are entirely harmless, while the mail, which nature has provided for the dentine, remains intact; but when the enamel rods become broken, decalcified, or otherwise disturbed, so as to admit the ingress of a solvent, they become actively accessory to dentine decalcification, and subsequent disintegration, as do also the tubules themselves; and they do this through their power, first of admitting the solvent, and second of affording habitat and protection to organisms which consume and disintegrate the organic material of the tooth, and supply as their product a mass which re-acts as a solvent upon the salts in the surrounding structure.

The cementum which covers the dentine of the root and is itself covered and nourished by the cemental or periodontal membrane, is less dense than the dentine, possessing a larger percentage of organic matter than does that tissue. It is, as compared with enamel and dentine seldom attacked by dental caries, for the reason, that when in normal condition, it is protected by its membranous covering. But when by virtue of location and surrounding influences, it becomes the seat of caries, the increased amount of organic matter it possesses and the pabulum and protection it offers to minute beings, greatly favors its progress and that too with more than usual discomfort to the patient. In connection with, or under the gingival borders of the gums and cervical margins of the alveolar process, it is not only an accessible cavity to fluids, but one that encourages the lodgment or impaction of food which in its fermentation, facilitates the advancement of the disease. In its structural arrangement cementum differs from dentine, but not in a manner to protect it from the ingress of fluids, when once its lacunae and canaliculi are exposed.

The organic matter of these two tissues, dentine and cementum, by continuity and interlacing of their fibers with one an other, is a source of sensation or nervous impulse and nutrition to the former dentine. This union and sympathy so frequently manifested, between dentine and cementum is by dentists recognized in a tooth in which the pulp has been devitalized.

The chemical composition and predispositions of these dense dental tissues, must not be overlooked in a paper on dental caries.

The fact that tooth density is almost wholly due to the presence of the salts of lime, and also that some of the acids which are at times found in the mouth, either as a result of systemic or of local conditions, readily act upon this inorganic material is important, and must be noted as a factor concerning the possible chemical changes taking place in the oral cavity. The secretions of the mouth, which, without cessation, are being emptied into it from its numerous glands, are of a constantly varying quantity and quality being subject to these modifications, through both systemic and local condition.

But it matters not what the origin of their normality or their abnomality, of their benign or their vicious influence, the effect upon the teeth is the same, and dental physiologists, and pathologists, must recognize in the saliva, an important factor in favoring or in modifying the progress of dental caries.

To ascertain with any degree of certainty the influence the fluid is at the time exerting upon the teeth, access can and should be had to some convenient and simple test, such as litmus paper, which when turned from blue to red, or restored to blue from red, gives with a good degree of certainty the acidity or alkalinity of the secretion.

It has just been stated that this salivary secretion varies through either systemic or local conditions.

The first inquiry that naturally arises from this statement is whether there is any one period in the individual's life, so far as age is concerned, when there is a greater tendency to an acid abnormality than another.

Second, whether there is any abnormal systemic condition that may favor or induce this unfavorable condition of the oral fluids.

Third, whether there are any physiological processes which may induce the same destructive tendencies in their secretion.

That the observing dentist recognizes a greater tendency to dental caries in the young than in mature or middle life, needs only to be suggested to be appreciated, and that this is partially or indeed largely due to a prevaling acidity of the saliva is quite as patent. But the *reason* for the prevailing abnormality of this fluid is not quite so clear—youth or immaturity *per se*, would not be a satisfactory explanation, so we must look for conditions accompanying this.

It is not probable that in this period of growth the demand made upon the nutritive currents for the building of the osseous srtuctures would exhaust their supply of calciferous element,

and hence so rob the blood of this ingredient that the secretions would on the slightest provocation present an acid reaction, and, again, with this minimum quantity of the essential salt, would not fermentations also be more active and their results manifest greater vigor, thereby producing that condition, so almost universally observed in the youth of both sexes, viz., rapidly progressing dental caries?

The lines of systemic normality and abnormality run so nearly parallel and contiguous, that the slightest deviation of the former may encroach upon and assume the rôle of the latter with all its attendant consequences. It is of little moment so far as the influence it may exert upon the oral secretions is concerned, whether this deviation be caused by states of fatigue—mental or physical—by anaemia from deficiency in quantity or quality of blood, by malaria, or by still more serious deviations, complicated with typhoid conditions. These abnormalities, would, one and all, if of sufficient duration, record their presence upon tooth structure, to be modified only by present or previous local conditions which would have power to retain their activity and destructive influences.

Physiological processes, may by taxing localities or organs, induce an irritability of the nervous system, or they may instigate what in medical parlance is termed nervous prostration, which acts very unhappily, not only upon tooth environment, but also upon the resisting power of the tooth itself; so that during periods of gestation and lactation as well as periods of prolonged intense mental application and anxiety, the dentist's labors are not only in greater demand, but his skill is taxed to its utmost, to keep such patients comfortable until the much needed operations can be better performed and sustained.

The effect of the above enumerated conditions is frequently first recognized through the accumulations upon the teeth. If these are of an acid and soft cheesy consistency, it is safe to assert that the dental tissues are suffering or soon will suffer from their environment, unless some remedy be applied to counteract its influence. On the other hand, a change from these abnormal systemic conditions to a more healthy physical state, is soon predicted by a change in the nature and consistency of the deposits upon the If thesh. teeth should be firm in attachment, dense in structure, and varying in color from a dark cream to a black, dental caries, if progressing at all, is not from the influence of the glandular secretions, but from a product of the fermenting accumulations of food or debris, in the interstices or sulci in the crowns, or spaces between the same; in a

word, from want of cleanliness. These conditions and their results are so readily observed, that with safety the assertion can be made, that the presence or absence of tartar or salivary calculus, or its tendency to accumulate, or the reverse, is of great significance regarding the progress of dental caries.

In recognizing the variety of influences that may promote or retard the progress of dental caries, the fact must not be overlooked that they do not all act simultaneously, nor are they all necessarily of equal duration. Conditions which may be termed predisposing causes of decay may be present in a marked degree in the form of vices of conformation, deficiency in quantity and quality of enamel and dentine, yet in as conspicuous a degree may decalcification of these abnormally developed tissues be absent. And again, the exciting cause of caries may be present in the nature of abnormal secretions, and their influence may be stayed or greatly modified by a previous condition of tooth structure, by cleanliness, and-ant-acids and anti-septics. The vitality of the tooth, and its recuperative power, are factors here which must not be overlooked, for the resistance which they offer in their antagonism to decay is important.

The principles involved in prophylactic treatment, and the proper selection of agents exerting such influence, should not be disregarded. The value of therapeutic measures when systemically indicated must be recognized.

In a word, the educated, intelligent and successful practitioner of dentistry needs to know, not only that teeth do decay, but the nature and source of the solvent and its antidotes.

He needs to know, not only that certain vices of conformation predispose to decay, but the causes of such malformations, the possibility of anticipating them, and the best method of protecting them when they exist.

He needs to know, not only that certain systemic conditions vitiate the secretions, but through what functional derangement they are engendered, and whether they can be corrected or anticipated and their influence modified.

DISCUSSION OF DR. PEIRCE'S PAPER.

Dr. Sudduth—I have listened to the paper with much pleasure but shall have to take exception to several statements of the essayist in regard to caries. The first is in regard to the recuperative power of the teeth. I think there is no question in the minds of active

workers, that the tooth is a passive agent in the process of decay, and that the only resistance offered by it, finds its expression in the pulp cavity. The office of the pulp is that of a formative organ, and when irritation, either by abrasion or chemical disintegration, occurs to the distal ends of the fibres, the irritation is transmitted to the odontoblastic layer, and as a result of such irritation, we have secondary dentine developed; which, so far as we have been able to demonstrate, is the only resistive action shown by the tooth in the process of decay.

I use the term decay as opposed to the term caries. In my experience I have never seen decay of cementum in the same manner as we have decay occurring in the enamel and dentine of the exposed portion of the teeth. The breaking down of the cemental portion, or root of the tooth, is analogous to caries in bone, and is carried on by the same process, viz., Osteoclasts. We should distinguish between the terms caries and decay—decay, for that process which occurs in the exposed portion of the tooth, and caries for the roots of the teeth, and especially for the breaking down of the bony tissue. I have never seen decay occuring in the cementum. In cases of pockets forming around the teeth in pyorrhea alveolaris, it has been my experience, that there is almost never a breaking down of the roots of the tooth, in the same manner that we find in the crown of the tooth. That absence from destruction has been a marked feature in influencing my deduction, in regard to the difference between the two processes. Dr. Peirce also spoke in regard to decay's being more active in youth than in advanced age. There are two or three clinical phases of the question, which I have not been able to settle in my own mind. I have not had the same experience in years of practice that many of you have had, and consequently I do not feel justified in saying anything definitely in regard to this one point, yet I would offer this suggestion in regard to it, that if such is the case that caries is more prevalent in youth than in mature life, the solution to the question will be found in that these teeth, being erupted in a poorly calcified condition, are broken down by the first result of the fermentative process, and therefore pass out of the way first—we have remaining only the strong teeth in after life, whereas, the weak teeth have disappeared in youth.

It seems to me that we know sufficiently regarding the process of decay to say positively that decay does not occur through the general acid condition of the saliva. Erosion may be the result of that condition, but decay, as we know it, which is the breaking down

of tooth structure first, by decalcification, and secondly, by the disintegrating process that takes out the basis substance, is due to something else than the acid condition of the saliva, and these old acid and other theories must be done away with, and give place to later ones.

Another point I noticed made by Dr. Peirce, was that of the periodicity of decay; during certain times of life, in youth or middle life we have a greater amount of decay than at other times. That an overtaxed condition of the system, has anything to do with the condition of the tooth itself as a resisting agent in the matter, I cannot admit for a minute, yet periodicity may be due to a certain action, which we have not yet fathomed. I have noticed it in my own case; but why it occurs I cannot say. It may be that at these times the patient gives less care to the teeth than at other times.

The, so called, exciting cause, abnormal conditions in secretions, mentioned by the essayist, has been answered in the statement that the secretions themselves, except in a very few instances, can not be said to give rise to the breaking down of tooth structure. You may have erosion at the gingival margin, but that is not decay. It is a different kind of process, and should come under the class of erosion rather than decay. We are positive that acids will not cause decay in teeth. They break down enamel and dissolve out the lime salts of the teeth; but the form of the den tine will remain the same. We must have something else besides acids. We must have a digestive ferment, and the only factors that will develop it are the micro-organisms found in the oral cavity. The germs are the exciting causes; others things are only accessory.

A perfectly sound isolated tooth, without a break in its continuity, will never decay. Micro-organisms cannot enter the tubuli unless the dentine is first decalcified. It is only when decalcification has taken place that they can enter and find a place to work. They must be in an enclosed cavity, and that is why we do not have decay in the pockets that form around the roots of teeth in pyorrhea alveolaris; the saliva enters freely and dilutes the acids produced by the micro-organisms at that point. The predisposing causes are, first, malformations with poorly calcified sulci; second, irregularities which give rise to pockets where micro-organisms can collect; and, third, abrasion, which is seldom a predisposing cause. The exciting cause in decay, which I would confine to the crowns or the exposed portion of the teeth is, beyond question, microbes, and the predisposing causes are malformations.

The paper was an excellent one, and the points to which attention was called, regarding the conditions which predispose to

poorly developed teeth, were well taken. It was a presentment we can all learn from, and the only exception I take, is in regard to the active agents in the causation of decay, and the distinction between caries and decay, and that the tooth is a passive and not an active agent in the process.

Dr. Faught—I was very much pleased with the paper and with the practical aspect of it. I think it sets forth some of the causes of decay. I emphasize the expression practical, because we all recognize the periodicity of decay, tendency and heredity are undoubtedly factors in certain conditions of the system other than the teeth, and must undoubtedly be considered in the question of combating caries. If caries be the result of acids breaking down the enamel, or of germs entering and disintegrating the dentine, then after we have placed the teeth in proper hygienic condition, we might be assured of the permanency of our work. But such is not the case, for with our patients constantly under our care, seeing them at near intervals, knowing them to be cleanly and to use the proper means to secure this end, even then we meet with recurrent caries; and whether it is a factor or not, we know of concomitant lowered nerve tone in the patient, and of which we believe the fluctuations make constant demands upon us for renewed effort to protect the teeth. This fact I want to emphasize, for I believe that one of our worst enemies is the nervous influences on decay. When lowered, caries progress rapidly and is of frequent occurrence; when normal, we find the teeth do not need so much care.

Dr. Sudduth—I would like to ask Dr. Faught a word in regard to lowered nerve tone. Might it not be that patients, owing to this condition, come to us with their mouths in a less cleanly state?

Dr. Faught—I think not. I try to impress upon my patients the necessity of oral hygiene. I take entire charge of their mouths, sending for them when I deem they need attention. They are patients who are very careful in all matters of cleanliness. They would not neglect it on account of lowered nervous tone. I find it invariably the case that in many instances we can trace the progress of caries and fix it upon nervous conditions. I speak of one lady in particular who passed through great trouble and her teeth began immediately to break down. She then had new conditions of life put upon her, and I saw that the teeth responded. Seeing so many of these cases which I care for, I must think that the question of nerve tone or nutrition in some way has decided influence upon dental caries.

Dr. James Truman—This is well-ploughed ground; but I am pleased that Prof. Peirce has responded to the request for a paper in the way he has. It is always satisfactory to get what I call an original idea, and I think I have received one to-night from the paper read, and that is: That, at the period of childhood, there is a deficiency of lime salts to meet all the requirements of the system; and that therefore decay progresses more rapidly. While it is true that teeth at this early age lack density, I question whether it is from a want of the constituent elements in the organization to supply them. That this can have more than an indirect influence may be questioned; the direct being in the tendency to fermentation and acid products at that age, there being necessarily an increased tendency in this direction at this time. I think he made the statement that teeth are not destroyed, if I understand him correctly, by the secretions of the follicles.

Dr. Peirce—When there is tartar deposit in the mouth.

Dr. Truman—Then you accept glandular action in the matter of erosion?

Dr. Peirce—Yes.

Dr. Truman—There are two prominent points in the paper upon which I wish to enlarge. I cannot agree with Dr. Sudduth that the density of teeth has nothing to do with the action of caries. The condition of the teeth necessarily affects the progress of caries, the density acting as a constant barrier to the inroads of the disease.

Dr. Sudduth—Allow me to correct, if you please. I said that there were no lime salts thrown out except upon the surface of the pulp, and that is what protects it from the influence of decay.

Dr. Truman—I also take exception to that. In irritations that do not extend beyond certain limits, there is increased deposition of lime salts.

Dr. Sudduth—In the pulp cavity only.

Dr. Truman—You will find it in the tubes of the teeth. I am well aware that I am in opposition to many—Black, Wedl and even Tomes—on this subject. Nevertheless, my convictions are positive, that depositions occur in the tubuli of the teeth, and that in sufficient quantity to act decidedly against the progress of caries. These gentlemen will probably not deny that the fibres that penetrate the tubuli are prolongations of the pulp, and are hence part of that organ and subject to its conditions and its physiological changes. If, therefore, secondary formations are possible in the main organ, independent of the odontoblastic layer, they are possible in the minutest branch. There can be no theoretical argument

that will apply to one that will not apply to the other; hence I regard the transparent zone of Tomes as a possibility. Any other view of the subject seems to me to be antagonistic to fact and reasonable analogy. Dr. Sudduth made the remark, if I understood him, that there is no destruction without micro-organisms; that the secretions of the mouth never produce destruction.

Dr. Sudduth—Acids produce destruction on the free surfaces of the teeth—erosion—but not decay.

Dr. Truman—Then I have no quarrel with you on that point.

Dr. Sudduth—I have here, to-night, a section of ivory, in which a ball was imbedded, and in which this translucent zone shows very prettily between the cavity and the sound dentine. I would say in regard to this translucent zone, that I have taken sections of teeth where this transparent zone showed as prettily as it does in in this section, and reproduced the normal appearance by soaking them in ether. I have also taken the sections of teeth and put them in an imbedding mass of paraffin, melted, and produced this transparent zone, getting the same appearance. Dr. Miller admits that there is a possibility of error; yet the fact that we can take specimens, and by dissolving out by the use of ether or essential oils the fatty portions of the fiber, which I have no doubt are dissolved out, thus clearing up this translucent zone proves, to my mind at least, that this translucent zone is a product of the disintegration of the fibrils themselves, which always goes ahead of the process of decay. I have never been able to demonstate that there is any decalfication there.

Dr. Kirk—Before the subject is closed, I would like to ask a few questions. Dr. Peirce used the term, "recuperative power of the teeth." As I understand it, Dr. Peirce is talking about one thing and Dr. Sudduth seems to be talking of something else. Dr. Sudduth confines recuperative action to the pulp cavity. Dr. Peirce's term applies to increase of density in teeth, from a lower condition to one of greater density. I think the microscope is not the only means we have at our command of distinguishing this question. There are certain facts that, to my mind, the microscope has not explained.

Dr. Sudduth—In what portion of the tooth do you say this occurs; in the enamel or the dentine?

Dr. Kirk—In the dentine. I read a paper in 1881, called "The Tooth in Pregnancy." In this I noted the various stages of dentine while women were in this condition, finding that when they bore children there was a decided loss of density of tooth structure, but in which repair afterwards took place.

A patient came to me from the hands of a dentist who had the previous year inserted thirty fillings. That lady has been a patient of mine for eight or nine years, and in that time I have not inserted a half dozen fillings. It is not due to difference of ability, because I know the man who filled the teeth to be a good operator, and I attribute the difference in the quality of her teeth simply to restored condition of health, and I know her teeth to-day are harder and denser than when I first saw her.

Regarding this matter of density I hold that a man whose fingers are educated, can tell the difference, and that his observation is just as good as though the microscope were used, whether he is cutting cheese or marble; and we have seen the periodicity of decay, with increase and decrease of density in tooth structure too often to be misled. What it may have to do with the question of the osteo-dentine, or secondary dentine, I do not know or care; but I wish to go on record as believing that tooth structure, which I will limit to dentine for the sake of argument, although I am not prepared to say it does not effect enamel—gets harder and stronger.

Another point. I do not quite understand the difference Dr. Sudduth makes between the terms decay and caries. It seems to me that they are perfectly convertible terms. He said that acids were not capable of causing decay of the teeth. He further says that all the acid does is to make a roughing of the enamel, which is followed up by the ingress of micro-organisms in that condition, which act as a fermentable substance, and he further states that fermentative action is the production of the microbes. It therefore seems to me that it is a localized action—localized because the micro-organisms are produced in one spot. They simply remove the lime salts from the tooth, and the gelatinous, or organic matter left becomes broken down. That is as I understand it. In regard to this acidity which we observe in the mouths of children, and where erosion of the teeth take place at the neck, Dr. Peirce's idea does not explain it all, I think. It explains the relations of the teeth to an acid condition, but does not afford an explanation of why the acid condition exists. I believe it does exist in the period of childhood much more than it does later on—part from a lack of cleanliness, and my own explanation as to its cause, which is purely theoretical, is this: Where the tissues are rapidly growing—where any of the structures are rapidly growing, means an increased determination of blood to that part, and a condition of mucous membrane the same as we see brought about by a local vaso-motor

disturbance. The effect on the mucous membrane at that time, is to produce an acid condition. The teeth, of course, being soft, and of a looser texture at that time are more rapidly acted upon.

I would like to ask Dr. Sudduth whether the teeth do not become denser through various periods of life, or having become dense, may not become less dense?

Dr. Sudduth—That goes into a question of chemistry, and one I think our president should himself answer. What we observe in the matter of density is the enamel, not dentine. The exposed covering of the teeth in the mouth is entirely enamel and the variations in density and softness relate more particularly to the enamel than to the dentine, and that is one reason why I asked the question of Dr. Kirk, whether it was the enamel or the dentine. We know that fermentation is a cause of decay, not a sequence. You cannot break down the substance of a tooth with an acid, You can decalcify bone, but you still have the form of the bone. The acid has simply taken out the lime salts. Caries is a process occurring in organic tissue in which the tissue itself plays an active part. Caries is confined to tissues that are buried in the soft tissues; whereas, decay occurs in the exposed portion, and is a process which originates outside the tooth itself, and in which the tooth plays a passive part. Decay is the result of microbic action. The free acid in the mouth causes erosion; but does not destroy the form. Decay destroys the form and is a process that occurs in organic tissue.

Dr. Kirk—I would like to ask if Dr. Sudduth believes that a tooth when once erupted remains the same all through life?

Dr. Sudduth—Certainly not. Calcification of the dentine at the time of eruption is not complete. It is only after a considerable time that the tooth becomes thorougly calcified. The enamel after the tooth is erupted, however, can change its density only from the saliva. When the tooth erupts the enamel is forever shut off from its original source of supply of lime salts, and the formative organ, the ameloblastic layer, becomes hornified and loses its function. Any change which takes place thereafter in the enamel is a chemical and not a vital action. The source of lime is then from the saliva and if there is any increase in the chemical constituency of the tissue, it is from without and not within.

Dr. Faught—I fear that my remarks have been misunderstood, they simply had this reference: If acids alone destroyed the tooth we should have comparatively good results as dentists in caring for the teeth. I do not believe this to be true, and even if we understood this matter thoroughly, I still believe we should have a world

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of trouble in preserving the teeth, as a result of conditions existing in the tooth and from the lowered nerve tone. I am not prepared to say how much is due to the one or to the other, but I believe clinically, that decay goes on and gives trouble on account of the lowered tone. If we only had the influences mentioned by Dr. Sudduth we should have a good time caring for the teeth. I should like to believe that there is more or less fluctuation in the conditions of the enamel as well as the dentine.

Dr. C. N. Peirce—Dr. Sudduth instances a case of Pyorrhœa where the pockets are large and open, and, though the cementum on the roots of such teeth is constantly subjected to the influences of the saliva, yet he has never observed decay attacking the cementum of such roots. I should be obliged to Dr. Sudduth, or indeed to anyone, for a view of a case of progressing decay where calcic pyorrhœa is present. I have never seen dental caries or decay progressing, in any dental tissue, where pyorrhœa alveolaris was present. Therefore, the fact that cementum has not, under such circumstances decayed, is no reason for assuming that it will not, under more favorable conditions, become the seat of this disease.

Dr. Sudduth—Has Dr. Pierce seen decay in cementum?

Dr. Peirce—Yes. If Dr. Sudduth would like an illustration of cemental decay, I would refer him to the mesial or distal surfaces of bicuspids, or molars, where a partial set of teeth on rubber is worn, with the plate impinging upon these surfaces, so as to retain particles of food, or any fermentable substance, in contact therewith. I think, in the large majority of such cases, cemental decomposition will begin within six months after the insertion of such partial dentures.

Dr. Sudduth—The cement is so thin at that point that it could hardly be called decay, no pocket is formed in the cement.

Dr. Peirce—Regarding the resisting power of the tooth, my experience has been that it increases or diminishes with the modification of certain systemic conditions. It certainly is the result of observation, that teeth for months, and even years, have been gradually decomposing, and then through the influence of systemic change, decay entirely ceases—this having been preceded by a change in the oral secretions, which is also the result of constitutional or systemic conditions.

This retardation, or as is somtimes observed, the entire or complete arrest of dental decay, followed by a brown eburnated surface where the decomposition had previously been active is due, I should judge, to both local and constitutional conditions, and

may very properly be termed a vital, as well as a recuperative effort of the tooth, for the pulp has been largely instrumental in its accomplishment. That the tooth, under ordinary circumstances, increases in density, I am well persuaded, and that this is accompanied by an increased resistive power, is also well attested.

The discrimination Dr. Sudduth makes between dental caries and dental decay, I think quite pertinent, and will endeavor to conform to it in my subsequent remarks.

In speaking of the origin of decay, I intended to be explicit in my paper, and give due and full credit to the organisms in their productions. I think I said emphatically, that dental decay is the result of the presence of low forms of life, but before they can take hold of the dental tissue, and act upon it as a digestible ferment, there must be a pabulum for their habitat and multiplication. There must be a decalcification so that the organic matter remaining shall offer the needed elements for home and reproduction; more than this they may do, some varieties of them may by their action consume the sugar in the debris, and secretions, and excrete an acid, and this may contribute to the primary decalcification, but this result may be modified, or even wholly arrested by the influence of systemic conditions upon the oral secretions.

The statement made in the paper regarding the deficiency and subsequently the excess of lime salts being dependent upon the demands of the system, varying with youth and advancing years, is in the form of an inquiry. But the invariable change taking place in the condition of the teeth with youth, from youth to adult life, is a strong argument in favor of the proposition. And, again, the noticeable deterioration of the teeth during periods of gestation and lactation, and their improvement after these periods have terminated, is also an argument in favor of the influence of systemic demands. These changes are observed quite irrespective of the effort of cleanliness.

Dr. Kirk—Is that due to the altered secretions of the mouth or to a change in the structure of the teeth?

Dr. Peirce—To both; the secretions have changed because the supply and demand of nutrition has changed. The blood, at one time impoverished in certain elements, is at another period surcharged with the same elements; and through this same nutritive fluid, it is my conviction, the teeth are also increased in density with adult life and advancing years. The continuity existing between the organic and inorganic is modified, that is, increased or deteriorated.

Dr. Sudduth—In which, the enamel or the dentine?

Dr. Peirce—In the dentine especially is it observed. There is so little organic matter in the enamel that it is not so marked, but I believe it is also proportionately increased in density. Only a few days since an illustration of this varying density and want of continuity was experienced, in the effort to excavate a cavity in a tooth which had on a previous occasion, been very dense, but on a recent effort it offered little more resistance than would a piece of cartilage.

Dr. Sudduth—Was that in the enamel or the dentine?

Dr. Pierce—It was especially in the dentine, although the enamel offered much less than the usual resistance. I have frequently noticed the difference in the structure and density of the same teeth in different periods of life and in different conditions of health—and this notwithstanding that Drs. Sudduth, Black and others say there is no change. The sharp excavator tells the story.

Dr. James Truman—Microscopists are remarkably apt to be dogmatical. Dr. Sudduth seems to be no exception to this rule. He asserts to-night that the investigations of Rainey demonstrated the existence of calco-globulin in the teeth. He does not give us any confirmation of this statement—beyond mere assertion.

Dr. Sudduth—I have often made the experiment myself.

Dr. Truman—You have not explained how or when. You also assert that the enamel does not increase in density after its first formation. I presume there is not a dentist in this or any other country that does not know from practical observation that it does change.

Dr. Sudduth—You have misunderstood me. I said that if it did become denser it was from the effect of the saliva.

Dr. Truman—Here we have another assertion. If it becomes denser, it must be by imbibition of fluids from the interior. You assert that there is no passage of fluids into the enamel from this direction. I must say dogmatically, that between every enamel rod there is something. What is it? You call it calco-globulin. I say it is organic tissue, and I have the investigations of Bödecker and Heitzman to support this assertion. Aside from this there are certain physiological effects produced, not possible if this were not so. The difficulty of making examinations in this tissue will, probably, prevent anything positive's being said in regard to this. Of one thing we may be certain—that old age brings with it increased density in tooth structure.

Dr. Sudduth—Is it the dentine or the enamel?

Dr. Truman—In both. If the physiological process of nutrition failed, there would be no teeth in the mouth. The density increases as age advances and the enamel, with the other tissues, has its source of nutrition. You say that dentine is formed altogether by the odontoblastic layer at the surface. You acknowledge that the density of dentine is increased. If the formation is confined to the superficial layer how is this accomplished? How are the lime salts deposited in the dentine? Is it by the action of the fibres? Or is it simply by imbibition? I contend that the only explanation is through the action of the fibres. It is impossible to prove this, and yet we are familiar with conditions that seem to demonstrate it. It is not unusual to find so-called senile dentine with the tubes partially or wholly obliterated; and there is another state, analogous to this, which may occur in middle life, a condition I have never yet seen explained, or even alluded to, except by myself. It is in cases of early loss of teeth, not by pericementitis or pyorrhœa alveolaris, but through a condition of the tubes in which absolute calcification has apparently taken place, in other words, the tubes with their parietes have been wholly obliterated. This prevents nutrition, and the teeth are slowly but surely thrown out of the mouth as foreign bodies. A case of this kind came to me some years ago. The gentleman was about 35 years of age. He possessed a beautiful set of extremely dense teeth. They were gradually loosening and without pathological conditions. I exhausted my skill in efforts to save them, and he eventually lost every one, and that in a comparatively short period. Examination microscopically demonstrated the cause. The tubes were entirely obliterated except for a short distance near the remains of the canal. The dentine in sections presented a clear transparent appearance, as devoid of lines as a piece of glass.

Dr. Sudduth—How do you know they were not always that way?

Dr. Truman—Had they been that way originally, nutrition would have been impossible in the earlier as it evidently was at a later period. Did you ever see a tooth without tubes?

Dr. Sudduth—I have never met with teeth in which the tubes were absent.

Dr. Truman—You will have to take my word for it, as I have not the specimen to show, that these tubes were filled up and obliterated by depositions of lime salts.

I do not believe in "periods of destruction." I cannot understand that there are times when the individual will lose more teeth

by caries than at others. This loss may occur at any age through physiological disturbance resulting in lowered nerve tone and increased acid secretion.

Dr. W. G. A. Bonwill—I wish to give you an illustration of the change in the dentistry of teeth. A gentleman 34 years of age came to me a while ago; he had good dense teeth, but they were loosening one by one. He was sent to me by two others, whose teeth I had treated, being similar cases. He had been to four of the very best dentists in the city within the previous three months. They told him he would lose them all. He went to Prof. Agnew, who said he must lose them. He went to Garrettson, DaCosta and Pepper, who all said the same thing. I found that all that was needed was a little common sense treatment. He had used a tooth brush most unmercifully, and the tissue was torn away. You could see the bone bright and clean by passing up where neither the brush nor the pick has ever touched, decay had gone on. To effect the cure I simply cleansed the teeth and cut off all super-abundance of tissue. I never saw teeth harder in my life. The gum has nearly grown around the teeth, and there is as perfect a condition as before. The roots of the teeth were as solid as the enamel itself.

Dr. Tees—My attention has been lately called to several instances of the beneficial effect of lime water, upon both the temporary and the permanent teeth of children under my charge. On account of the way in which children are fed in this country, being given all manner of food from earliest infancy, we seldom meet with such cases. The first case was that of a young girl about fourteen years of age. She had a most perfect set of twenty-eight teeth, with no decay in any of them. I asked the mother what she fed her upon in childhood. She replied, that at birth nothing would lie upon her stomach. The physician directed the child to be fed upon cow's milk with a tablespoon of lime-water in each tumblerful. Upon this diet she was brought up until she was five years of age. After that she ate bread and butter and eating sparingly of other articles of food, and refusing to eat candies, cakes and other goodies which children generally crave. This young lady is now eighteen years of age, and has one cavity filled. I am sorry to say that she has affected the trashy food of American young people for the past two or three years. I asked the mother how she accounted for the decayed condition of her son's teeth. She replied, "Doctor, his grandmother brought him up."

In another instance a boy five years of age had perfect deciduous teeth, while his sister, three years of age, had teeth in an

advanced state of decay. The mother said that the boy had been fed upon limewater and milk until he was four years of age, and she personally saw that it was given him; while the little girl, during babyhood, was in charge of the nurse, the mother's time being devoted to her invalid husband.

The following letter was received from Dr. E. Payson Quick, corresponding member:

SANTA BARBARA, CAL., Dec. 10, 1888.

To the Recording Secretary of the Odontological Society of Penna.

DEAR DOCTOR.—My health being somewhat restored, I opened an office in Santa Barbara, the first of November. I have a case on hand that I would ask the advice of the Society upon.

Patient is a lady, twenty-eight years of age, with good family history. Trouble began about twelve years ago, when a crackling noise was noticed upon opening and closing the mouth; This was followed by a gradual stiffening of the muscles and ligaments of the jaw, so that the mouth could not be opened more than half its normal width. At the same time the lateral movements became very imperfect. At times there is a twitching of the buccal muscles and a peculiar sensation in the tongue. There has been some, so-called, neuralgic pains, but not very severe. All the teeth are in place except the wisdom teeth, and quite a number are filled. The superior central incisors have had chronic abscesses for several years. I have treated them, and the teeth are now in a healthy condition. I have probed carefully for the wisdom teeth, but cannot detect them.

Now, is not this most likely a case of impacted wisdom teeth pressing upon the third division of the fifth pair of nerves, and by this constant irritation for years, bringing on this abnormal condition?

The patient has been in the hands of a number of physicians, but has not received any relief. I have advised the extraction of the second molars, but she fears the operation. So I am trying stretching the muscles and ligaments by placing a cork between the teeth for a few minutes each day, and also having her apply friction with the hands over the parts. By this treatment I have gained over half an inch.

What would the members of the Society advise in this case? Would they advise the extraction of the second molars? An opinion will greatly oblige,

E. PAYSON QUICK, D.D.S.

The following committee was appointed to answer the letter: Drs. James Truman, C. N. Peirce, S. H. Guilford, I. S. Fogg, S. E. Gilbert.

3249 Chestnut Street,
Philadelphia, Feb. 10th, 1889.

Dr. E. Payson Quick,
My dear Doctor.

Your communication of Dec. 10th was referred to a committee to consider and reply to. As chairman of that committee permit me to say that in my opinion, the case does not present all the indications of an impacted tooth, certainly not of pressure upon the inferior dental nerve. It possibly may have an indirect influence. Direct pressure, in the horizontal presentation, will produce severe neuroses. I doubt whether extraction of the second molar would avail anything. Loss of power in the muscles of the jaw is by no means unfrequent. In a similar case I used pressure between the teeth without much result. I then applied the galvanic current, with one pole at the neck with a wet sponge, and holding the other in my left hand. I used my right to manipulate the jaw, thus passing the current through my own body, modifying it to that extent. I had the pleasure of restoring the lady to a normal condition in about a week. Similar treatment might be of advantage, and the sooner the separation is accomplished the better.

Dr. C. N. Peirce does not think the conditions described warrant the extraction of the second molars, and before resorting to that treatment, with the present developments, would certainly advise application of the galvanic current.

Dr. S. H. Guilford is inclined to favor the theory of impaction of the third molars, as the cause of the trouble. He would recommend, first, the application of the galvanic current, and if that should fail, then the extraction of the second molars.

Dr. I. S. Fogg inclines to the opinion that an impacted tooth is the cause of the trouble. He would not however, resort to extraction before adopting the treatment recommended by myself, particularly in view of the slight improvement you report in your letter as having been gained by friction, etc.

Dr. Gilbert in an interview coincided with my views of the case.

Truly yours, JAMES TRUMAN, Chairman.

JAMES TRUMAN,
C. N. PEIRCE,
S. H. GUILFORD, } Committee.
I. S. FOGG,
S. E. GILBERT,

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THE regular meeting was held Saturday evening, April 6, 1889, at the hall, Arch and Thirteenth Streets. President Kirk in the chair.

Dr. Kirk introduced the subject of perforation of the antrum in implantation, and possible pathological results.

Dr. Kirk.—At the February meeting, when Dr. Ottolengui read his paper, I was compelled to leave, and I feel that I did not get the full benefit of what was said. As the subject of the antrum in its treatment is of importance to all of us, and as I have had some experience in implantation, I want to speak further upon the subject. Dr. Ottolengui reported a case where the antrum was accidentally perforated. An excessive hemorrhage followed, and, in order to stop this, he inserted the tooth, and allowed the patient to remain with the tooth in position for ten days. Symptoms of septicæmia set in, and the patient was in a critical condition for some time. The case was treated by a physician in connection with Dr. Ottolengui, and she was restored to health in due time.

The inference that Dr. Ottolengui drew, or that was drawn by those present, was that the operation of implantation was directly chargeable for the unhappy result that followed. In my remarks on the paper, which were hastily made, I tried to bring out the point that the operation of implantation in that case was not, *a priori*, to be charged with those unpleasant results, for the reason that he had a hemorrhagic disease to deal with, and the antrum filled with blood, which was allowed to remain there and decompose, and set up the attack of septicæmia which followed. I took the ground that such a result might have followed the extraction of a tooth, or any procedure that would expose the antrum. I further said that I did not believe that the mere perforation of a healthy antrum by an instrument during the operation of implantation is a dangerous proceeding. My reason for this is based

upon these points. The antrum, as you all know, is lined by mucous membrane, which is contiguous with that which lines the oral cavity and naso-pharynx. It is not closed, but is open to contact of air, the same as any of the respiratory passages are; so that it is not to be classed with the closed cavities of the body, where the inflammation may arise from the sudden ingress of air. It already exists there, and the catarrhal inflammation of the lining membrane of that cavity is not to be looked upon as a serious matter at all. I think we have it very much more frequently than we suppose. I can recall half a dozen cases where, passing up the canal of bicuspid teeth, the broach has passed beyond the apex and entered the antrum. Now, in such cases as that, when inflammation of the apical end of the bicuspid of a suppurative character exists, there is no doubt that the discharge that flows into the antrum is local in its expression, and probably is never noticed.

My attention was called to it when a gentleman came to this city from Scranton, and I was asked to extract what I called a reasonably good six-year molar. Dr. Harrison Allen said, "I want you to extract that tooth, because I have determined it is the cause of an antral catarrh. I had my doubts about the necessity of extracting it. If I had no knowledge of the nasal difficulty, I would not have done it. I did as he asked me to do. In passing a broach through the socket on the palatine root, I found it readily passed into the antrum. He asked me to make a much larger opening, which I did with a drill that was spear-pointed and almost three-sixteenths of an inch in width, and he proceeded to wash the antral cavity. The patient had suffered for ten years with nasal catarrh. Dr. Allen asked him to return the next Sunday, one week later, to have the treatment renewed. He received a letter two weeks later, the man saying he did not come, as requested, because the catarrh was entirely well, without any trouble. Here was a case of alveolar abscess resulting from the apex of the palatine root, where the discharge was through the antrum and out through the nose,—one of those cases that frequently occur. It was a case that was confined to the apex of the root, and the mucous lining of the antrum was not involved. It is very probable that the inflammation set up at the denuded apex of the root extended to the entire lining membrane of the antrum. There can be no doubt that the proper treatment in such cases is to remove the cause of the trouble and extract the root, or, if possible, remove the cause of the abscess, and, after removing it, treat the mucous lining of the antrum with antiseptics and sedatives.

The antrum affords a good lodging-place for vitiating secretions. Where they are irritating and thrown off, it becomes bad, because the inflammation goes on to the formation of necrosis of the interlining bone; but, in all cases where the disease is non-malignant and purely of a chronic inflammatory character, get access to the antrum in all its parts, and treat it by washing out with proper medicines. I wish to have the thought relating to Dr. Ottolengui's operation and its possible pathological effect upon the antrum confined to cases of a non-malignant character. I do not see why the perforation of a healthy antrum should result in the slightest difficulty. I have had more experience in this. I have reported in the current number of the *Cosmos* where I have had the antrum opened twice, and so far as to get it healed: there was difficulty in keeping it from healing. The first was taking some tissue from the floor of the antrum,—made a one-fourth-inch opening, and union took place in three or four weeks afterwards. I have never yet failed where I have tried to get it closed. The man died from tuberculosis before it got well.

Now, if there is a danger in opening the antrum, I would like to have it brought out. It seems to me that too much stress is laid upon opening into that cavity, and if any gentleman knows where an injury has occurred I would be very glad to hear from him.

Dr. James Truman.—I do not agree with Dr. Kirk that there is no danger in opening into the antrum. I have had some experience in that direction, and I have never been able to close up readily the artificial opening. I have had several cases where it was impossible to close it up, and it continued for several years, always annoying to the patient. It seems to me that there is a practical difficulty in the way. If you make an air-hole into the antrum of, say, one-fourth of an inch, it assumes different proportions, and I do not believe that new bone will be developed to close up that opening. It occupies, in my view, very much the same relation as an alveolar abscess, although, as a secondary abscess opening into the soft tissues, it is not liable to give pain. If it is simply covered up with a development of soft tissue, without a closure, as I understand closure, there is a difficulty in keeping food from getting into the antrum. I have had to make plates in order to guard against this; otherwise constant syringing would be required.

The objection I made the other evening was simply in the implantation of teeth, as the operator might readily enter the antrum.

If this is going to happen often, then it is time to sound a warning note to prevent the careless operations of novices. I have no doubt Dr. Kirk's cases are all true, but he may get hold of one where there is some systemic difficulty that he is not aware of, and the irritation set up in the living membrane may become chronic. Possibly his cases may have all been healthy systemically, but this cannot always be.

Dr. Faught.—I am very much interested in the possible pathological results of implantation. One of the retarding features to the practice is, possibly, the complication of the antrum with certain relationships. I cannot agree with the statement of Dr. Kirk in reference to the communication of the antrum with the outside air. The atmosphere has not the same free ingress and egress to this cavity that it has to the other portions of the respiratory tract. Then, again, we must always remember the relation which the antrum bears to the immediately adjacent tissues,—the orbit of the eye, the frontal sinus, etc.,—for these relationships make it extremely important how we act. I agree with Dr. Truman that there may be trouble from antral relationships. I have had some experience with antral cases. The openings into it have been usually the result of extraction, and, while they are not serious, I rather dislike to approach them, knowing the trouble of keeping the cavity clean. To my mind, the greatest difficulty in antral cases does not arise from contact of air so much as from the contact of other foreign substances. In treatment, the opening is often unduly enlarged by careless treatment. I do not think we should make an opening as large as mentioned by Dr. Kirk, but you must have it large enough to cleanse the cavity. The quicker you can bring the tissues into position and induce healing the better it seems to me to be. In the several cases I have had in difficult positions, I never had any trouble in getting them to heal.

Dr. Head.—I think Dr. Kirk meant to say that it is not dangerous to perforate the antrum for the purpose of implanting a tooth. If that is so, Dr. Truman's and Dr. Faught's objections to it have no good grounds, for the reason that the tooth, when implanted, grows to the adjacent tissues. The tooth cannot give rise to alveolar abscess; because the apex is filled with gold, it is impossible for any material to enter into the canal which could give rise to inflammation afterwards; therefore, if Dr. Kirk makes a hole in the floor of the antrum for the purpose of implanting a tooth, he immediately afterwards fills that hole with a substance which, by growing to the adjacent tissues, will act as a perfect plug.

Dr. Register.—In my judgment the antrum is so placed anatomically that there should be very little fear of penetrating it. When it does happen in a healthy mouth, I can see no reason why serious consequences should follow the operation. The antrum of Highmore is nothing more than a sinus for the purpose of producing lightness of bony tissue, and in the cavity is reflected a mucous lining, the same as through the internal parts of the body. It is so formed that the mucus secretions pass out with very little obstruction except in some catarrhal troubles, and in these there is sometimes a foreign accumulation. My only apprehension, where the antrum is perforated, would be in the apex of the root of the tooth passing into it, and thus be a source of irritation that would in time cause nature to throw out the tooth; it would prevent the natural processes from absorbing the pericementum in a regular way, it being an action which is followed by a reaction. With few exceptions, I think there is very little danger in entering the antrum, certainly not enough to prevent any one from performing the operation.

Dr. Tees.—During a practice of many years I have never yet met with a disease of the antrum, and for this reason my views coincide with Dr. Kirk's,—that it is hardly possible that inflammation could be set up in that cavity from merely piercing it with a drill. The many cases of extraction of diseased molars would frequently bring to our attention troubles in this cavity if inflammation so easily supervened.

Dr. Guilford.—I am much pleased with the paper, and also with Dr. Truman's remarks. I am happy to say that, not having implanted any teeth, I have never perforated the antrum in that way.

I think there are some here who would be glad to talk upon the subject of abscesses. Each one has had his quota of cases, and I have had some failures. I think that possibly some word regarding these might instruct others and prevent their having similar results. One failure I met with happened not long ago. I was in New York City and attended the meeting of the Odontological Society, when a paper upon diseases of the antrum was read by a gentleman from Baltimore. He recommended that the tooth should not necessarily be extracted for the purpose of gaining access to the antrum, but that it should be penetrated by drilling through the alveolar septum, between the teeth. The method was approved by Dr. Atkinson and others. In my next case I tried drilling up through the alveolar process into the antrum. I failed, because the

opening was not large enough to relieve the antrum of its contents I do not think we have room enough to make the opening sufficiently large. Another mistake is injecting into that cavity liquids that are too strong,—such preparations as chloride or sulphate of zinc, used in strength. I have had the best success with a five-per-cent. solution of carbolic acid, which is all the acid that water will take up; also with sulphate of zinc, five grains to the ounce. Have the hole large enough to treat, and do it with mild remedies in weak solution, and repeat it every day or two. In the early days of my practice, a gentleman in good health presented himself for treatment. I entered the antrum through the socket of one of the molars, and each day injected a five-per-cent. solution of carbolic acid. A cure was effected in two weeks' time. What I want to impress is the use of mild remedies. There is such a thing as stimulation, and such a thing as over-medication and irritation.

Dr. Tees.—Have you met with many cases of diseased antrum outside of the clinics of the dental college?

Dr. Guilford.—I have had in my office practice, extending back over twenty years, about eight or ten cases.

Dr. Faught.—I am glad that Dr. Guilford mentioned this point, for I believe that in antral trouble there is danger of over-medication. In holding back the tissues I like a straight instrument, and one point to remember is to have it perfectly smooth. You do not want a sharp, penetrating instrument, but such an one as comes in Dr. Flagg's filling set No. 5. This you can pass through the opening and with it gently push away the tissues and enlarge the opening, producing no irritation, and then wash out the cavity with a syringe. I certainly believe that nitrate of silver and many other forms of medicaments recommended in the books do more harm than good. A prescription I like very much is listerine, diluted. Also, a weak solution of Pond's extract has been a pleasing remedy to me,—on one occasion, Pond's extract and a very weak solution of phenol sodique mixed.

Dr. James Truman.—The antrum is not a perfectly smooth cavity inside. If you will examine a number of skulls you will agree with me that it is almost impossible to drain it, no matter how you make the hole. There are ridges there that prevent it being thoroughly emptied. If you syringe in strong solutions, you will have them remaining there, and it is likely to be a source of constant trouble. I agree with the gentleman that it is poor practice to use strong solutions.

Dr. Place.—I have had but one experience in opening into the

antrum, and that was a short time ago. I was called in to see a gentleman who was very low with consumption. He had had a six-year molar extracted to relieve him of an abscess. The dentist, after extracting the tooth, had bored through the process into the antrum, and, as a result, produced an opening between the molar and bicuspid one-quarter inch in width, from which issued a very offensive smell. When I first saw it he had it stuffed full of cotton. I suppose in such a case there is not much to do but to keep it properly drained and treat antiseptically; but it occurred to me that the dentist, after extraction, might have removed too much of the process, and by reason of the patient's anæmic condition could not get a healthy granulation to heal it.

Dr. Register.—Regarding the cleansing of the antrum, I have had several of these cases, and the difference in result between the use of the syringe and the atomizer in applying medicinal agents is so much in favor of the atomizer that I now recommend it to all of these cases.

As Dr. Truman rightly puts it, the interior of the antrum is not a smooth cavity: instead of its being regular in shape, it is rather the opposite, and it is impossible in treatment to properly cleanse that cavity by using a simple syringe and applying a very little force in that way; but in the use of the atomizer, with great force back of it, the air being under pressure, and using the medicinal preparations in a weak state, it is easy to cleanse it of all accumulations, which, by decomposing, would possibly lead to necrosis. I have used it in three or four cases, and the results were satisfactory in the extreme.

Dr. Head.—Does the gentleman sterilize the antrum?

Dr. Register.—I only use the liquid mixed up in the atomization with the air.

Dr. Kirk.—The one point of interest to me in this matter is that formulated by Dr. Head, who said, "If Dr. Kirk makes a hole in the antrum for the purpose of implanting a tooth." That is the text I want to preach on. I do nothing of the sort. In all the operations I have performed, I have never perforated the antrum, to the best of my knowledge. I take special care to prevent it. I measure the depth of the drill, and afterwards use the reamers. If a perforation has taken place, then it is the size of the first drill I use. I do not consider a perforation of that size a dangerous proceeding, because the cavity is immediately plugged up by a sterilized tooth.

Cases of antral catarrh are more frequent than we have any idea

of. People are going through life with what they suppose a mild form of catarrh, discharging from the nostril, and it may scarcely be sufficient to excite their notice. I have seen a number of cases depending upon abscessed condition of the roots of some teeth, which were in close relation to the antrum; and it has become a practice when treating these cases to ask, "Have you any nasal discharge on that side?" And I have sometimes been told that they had; they believed it was a nasal catarrh. There is a case of alveolar abscess I have now,—a second bicuspid that came to me in the last stages of suppurative inflammation. The face swelled up, and I applied remedies to the gum over the apex of the root. The swelling afterwards went down. I think time will show a discharge into the antral cavity. Where we have cases of abscess of the second bicuspid or palatine root of the sixth-year molar, and pain suddenly ceases, I think, in a majority of cases, you will find the discharge has gone into the antrum. I had a case of antral disease where all the treatment failed. A more thorough exploration of the cavity revealed a growth of tissue, so placed that it was impossible to introduce medicinal preparations properly. I broke down that wall, and then it got well.

Regarding such strong remedies as chloride and sulphate of zinc, you can use them diluted without producing destructive inflammation, a solution of two or three grains to the ounce not being dangerous.

In regard to the character of opening made into the antrum for exploring purposes, nearly all cases of antral trouble I have had have been where there was one or two teeth missing. The sort of space I would make would be on the buccal side of the ridge, up pretty high, and through the soft tissues in a way that it would form a flap for healing afterwards. I have never had any difficulty in healing.

THE regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, June 1, 1889, at the hall, Arch and Thirteenth Streets. President James Truman in the chair.

The subject announced for the evening was Patents, by W. G. A. Bonwill, D.D.S.

Dr. Bonwill.—It has been my intention for the past four years to bring before you what I have to present to you to-night; but before making this presentation I wish to have a fair understanding with this Society. I have brought one thing here that I do not propose to give you outright, but will ask you what I shall do with it,—whether I shall give it to you, or patent it, and make money out of it. I have tried the dental profession in many ways, and I suppose they have been very much tried with me, but I think it is not too late to have a fair understanding; and in this agreement with you I want the liberty to take care of myself with regard to my inventions, on which subject there has been so much said lately *pro* and *con.* I wish to explain to you how I have always stood regarding patents; and then, if my conduct has not been consistent with the ethics of this Society and the general ethics of the dental profession, I shall myself present a charge against myself, so that it may be decided, gentlemen, whether I have acted right or wrong in this matter. My object is for you to answer me if I have erred. On the other hand, if there is nothing I have done, then please be men enough to say so and publish it. I have certain rights in my own Society, and as I bring two of the best things of my life to present to you, I want to know before I go any further whether I have a right to say anything I wish to in regard to defending my course for the past thirty years. If not, I will hold myself aloof from the dental profession hereafter.

Dr. Sudduth.—I see no reason why Dr. Bonwill should not present his views on this matter. I therefore move that he be allowed to give expression to them before the Society.

Dr. Head.—I second the motion, and hold that free speech be allowed Dr. Bonwill.

The President.—It is not necessary; Dr. Bonwill has always a right to express his opinions. But in view of the fact that he has asked for a general expression, all in favor of Dr. Bonwill being allowed full use of the floor, etc.

Carried.

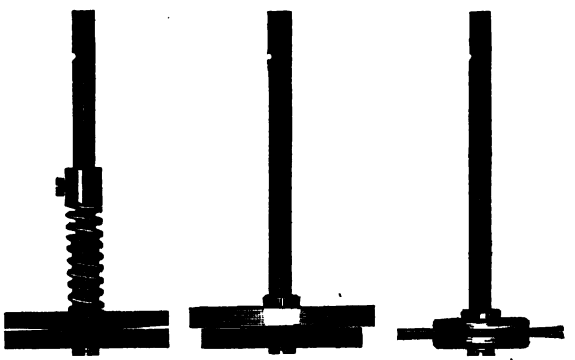
Dr. Bonwill.—I would ask, further, that these proceedings be published either in the INTERNATIONAL DENTAL JOURNAL or *Cosmos.*

Dr. Sudduth.—They will be published in the INTERNATIONAL.

Dr. Bonwill.—I have brought to you to-night three things: 1. A little instrument,—one of the most important I have in my office,—a nerve-broach reducer. Very frequently in getting into he finest pulp canals you cannot secure a suitable broach in the market for the purpose; nor can you make one by the most careful filing with anything like satisfaction. Three or four years ago, by a mere accident, I placed two corundum wheels on my laboratory lathe,—simply one small one that had been worn on one side at a slight bevel, and a little out of line, merely as a nut to hold the other,—leaving a slight space between them, as in cut. It immediately struck me that by placing a coarse corundum wheel and a soft rubber disk on the same mandrel, and screwed together, you could rasp down a broach to any desired size. By experimentation I found it was better to use two shellaced paper disks, and to have on either side of these a disk of soft rubber, so that it will keep these disks so close together that in passing your fine wire in between them while they are revolving rapidly, you can cut the broach down to an almost infinitesimal size,—the finest you can cut steel. I have never had anything that has given so great satisfaction; Swiss and English makes both failed me.

For reducing steel piano-wire, evenly tempered, use two corundum wheels kept together by a coiled spring (see cut), and afterwards use paper disks with the soft rubber on either side, for fine work.

FIG. 1. FIG. 2. FIG. 3.



Bonwill's devices for making nerve-broaches from stub tempered steel piano-wire, and for reducing Swiss broaches to an infinitesimal size.

DESCRIPTION OF APPARATUS.

No. 1 consists of two sharp-cutting corundum wheels, used dry, with one at a slight bevel, as shown in cut. The outer one is

screwed fast to mandrel made for the purpose, and the inner one is shellaced to a thin sleeve, which moves lengthwise only on the mandrel, and is controlled by a coiled spring, the tension of which is regulated by the movable collar and screw on the mandrel nearest the chuck of engine hand-piece or lathe. The collar holding the corundum wheel is prevented from turning on the shaft by a pin running through it, and on a flattened surface of mandrel. This is for heavy work of reducing tempered stub wire, but will do so to a very fine broach.

No. 2 is a shellac and corundum wheel and a soft rubber disk of plain packing rubber on the inside next to the hub on mandrel, and both secured tightly to keep from turning. The rubber disk should be of greater diameter to allow the broach to be guided in between them easily. The edges at the periphery will be slightly apart when screwed up tightly. Both revolve at the same time.

No. 3 is made of two one-inch shellaced corundum paper or cloth disks, coarse or fine,—better medium for the last, which is used for very delicate work,—and on both sides of these a half- or three-quarter-inch soft rubber disk, cut from packing rubber and placed around; all screwed tightly on mandrel. There is no trouble in making them from the material every dentist has on hand, if it be only the paper disk.

In making No. 1 the bevel should be very slight and perfect, as the broach is so small. The inner wheel should have controlling it a very stiff spiral spring, nicely adjusted, to permit the broach to go down between the wheels. While the broach or wire is being cut it should be revolved constantly to keep it perfectly round, and the point kept in towards the centre of the wheels, in order to more perfectly point it. They are held by a small chuck hand-piece while being cut, and when in use are fastened to a very light handle.

When reduced to the desired size the barbing is easily done by taking an enamel chisel, very thin on the edge and very hard. Place the broach in a sliding tube-holder or chuck—same as for holding it securely while cutting down with the corundum wheels —and hold under it a piece of glass or any hard, bright surface. Hold the chisel at ninety degrees angle to the broach, commencing near the point, and with the blade of the chisel held on the broach, not directly at right angles with it, but with the right edge or corner of chisel turned farther away from it, so as to throw the barb up the right side of its length, in order to insure its catching

the pulp. If cut directly across, at right angles, it will not do so nicely. A slight pressure on the chisel will raise a barb—be it ever so slight—that, if cut to the right, will be sure to catch the pulp every time. Do not make more than three or four barbs, and close together at the point, and not so deep as to endanger its main strength. This can be very successfully done by a little practice, and should always be made at your leisure, that it be not hurried and best results follow, which can only come from a delicate and experienced touch.

2. I made about two years ago, when Dr. Woodward presented his new matrix, the appliance I present to you here to-night. It is applicable in a great many cases. It is easily adjusted, and you can make a very perfect operation on marginal cases, and it can also be removed without difficulty. It is adapted for gold or amalgam, and allows of the matrix being removed without interfering with the perfect contour of the filling, which can be made in this way only, since it fits snugly the cervix, and very little, if any, trimming will be needed there afterwards. When there is a cavity opposite to the one being filled it should be filled with pink gutta-percha to back up the divided matrix and prevent it springing back into the cavity. Each jaw of the matrix is double, and can be turned end for end. It is also shaped on both sides, that cavities in adjoining teeth can be filled without change.

This matrix will be more easily understood when I tell you to shape, either in brass or hard rubber, a piece to fit perfectly the buccal side of a bicuspid or molar, and made to run half-way through; and another from the palatal or lingual side adapted thereto, and also running through to meet the one from the buccal side. These, shaped nicely to the contour of each tooth, are now attached to a clamp such as is used for rubber dam, to a universal clamp by a thread and screw, to allow the jaws to adjust themselves to the surfaces. These jaws can be unscrewed and others substituted.

3. The third invention is something to which I wish to ask your serious consideration,—whether I shall patent it or present it to the dental profession. It is a right-angle plugger, and as important in its way for either the electrical or mechanical mallet as the right angle is to the hand-piece of the dental engine. Last January, when surrounded by my family at dinner, the idea of this instrument flashed in my mind, and I knew at once, without trial, it would prove satisfactory. I had long felt the need of a right angle for my pluggers, and this accomplishes it as perfectly as if it were

simply filling in a straight line. With it I see no further change needed in these instruments. It fills a gap not hitherto approached. Many cavities heretofore that should have been filled with gold were made with amalgam. It is this I now offer you for a verdict. But before presenting it I desire to speak of my position as a patentee. You must all grant there are two sides to every question, and this one is no exception to the rule. A great effort was made by Dr. Merriam, some time ago, to have it understood that we cannot be professional unless we give unreservedly everything to the dental profession, no matter what we get up and what it costs us in the shape of time, money, etc. His arguments were merely assertions, and they have no weight unless backed by evidence. Personally, I have but two things for which I feel answerable, and these I will mention. Before I had much experience, and while in Delaware, still circumscribed by unfavorable surroundings, with very little encouragement, no dental society, and in communication with only one dentist in the State, on the spur of the moment, in my experiments, which I commenced early in my career, I thought of electricity for the purpose of removing nerves painlessly and obtunding sensitive dentine. I had no sooner patented this than I saw I had made a mistake. I never mentioned it as a patent afterwards. I found it good, but experiment gave me something better,—rapid breathing as an obtunder. I gave all to dentistry. The only other incident in my career for which you can censure me, as I look at it, would be when I came here to live and placed my electric mallet and dental engine on the market. (I have never asked a man to purchase one of my inventions.) After that I had received many strong testimonials from Drs. Darby, Guilford, and others, which I published in a circular, placing it on the stand with my exhibit in the Franklin Institute, where I was afterwards awarded a silver medal. In it I merely stated the virtues of those instruments. I was afterwards sorry for doing it, as some of the gentlemen took exception thereto. It was not done with any bad spirit, or to make practice, for at that time I had an income that would surely keep the wolf away. I only thought it was right to give to the world the testimonials in favor of the instrument used by leading dentists.

I have not patented everything that I have made. Numerous things have I gotten up which remain unpatented; one of the most important of which, when it is understood, is the "anatomical articulator." It was the first thing I ever did, and I gave it to the dental profession at the meeting of the American Dental

Association, through Dr. J. H. McQuillan, and I do not think the proceedings show that I was even thanked for it. It was not discussed; it dropped flat. Another instance I will mention. I went to Saratoga to the American Dental Convention, and presented there the appliance that so much has been made of since by Dr. Talbot, of Chicago,—the "spiral spring" for correcting irregularities. A man sitting in his shirt-sleeves (and no gentleman would do this in the presence of others) abused me most personally for presenting such a thing as that, even as a gift. I felt like going through a knot-hole. If anything would have dampened my energy, and put a bad spirit in me to never present myself before a dental society again, it would have been the action of this ignorant person. However, it did not stop me, as results since show.

Now, if you will look back you will see a number of appliances belonging to my engine that were brought out through my instrumentality by Dr. Arthur, of Baltimore, and at my suggestion, as his letter to me shows, the shellaced disk was made; yet I made no effort to patent it. The different corundum points, known as the Northrup forms, were gotten up at the same time as my dental engine,—in 1870. (The first engine put on the market was in 1871.) Then came the soft rubber disk, the hard rubber corundum disk, and the soft rubber corundum disk; rapid breathing as a pain obtunder in the treatment of sensitive dentine and extraction of teeth, which Brown-Séquard, of Paris, and other physiologists say was a new discovery and practicable; the diamond drill in dentistry and surgery, for dental engine; the pointed fissure burr to do away with the file in separating teeth for filling and anticipating decay, and finishing gold and amalgam filling at the cervix.

The first right-angle attachment to the dental engine was made and given in 1873, which was well worth a patent; the use of Japanese bibulous paper for pressing surplus mercury from amalgam fillings when placed in the cavity, which was as much of an advance in that line as was cohesive gold.

The little apparatus I now give you for reducing nerve-broaches from wire to an infinitesimal size cannot but be of universal use, as nothing before filled the breach.

Lastly, which should have been among the first, the application of a specific oval face to the pluggers for the electric and mechanical mallets, like the face of a gold-beater's hammer, which spreads laterally while packing in a straight line. This alone was enough. When realized and practised it will forever revolutionize the pack-

ing of gold by "wiping it in." It reduces to a certainty that gold can be almost welded to the surface of a tooth. It saves two-thirds the time and nearly all the labor, is easier to the patient, and prolongs the operator's life. When Herbst saw it he at once acknowledged that his method was anticipated years before.

One more thing given: Abbey's old-fashioned soft gold foil was, considered of no use under the mallet. For the first time I reversed the decision. In 1870 I demonstrated with the electric mallet it could be used with smooth oval-faced pluggers, and welded the same as cohesive gold. It is no longer doubted. It made soft foil equally valuable and more so than cohesive gold, and the discovery was paramount in importance to all my others.

For the first time in the history of surgery I applied the diamond drill to remove a stone two inches in diameter from the bladder of a female, using my surgical engine, with the many appliances connected with it.

The jack-screw for elevating fractures of the skull instead of trephining was an invaluable affair, and patentable.

All these I have made no effort to secure by patent. They are gifts. Are these not enough?

I have always considered that anything a dentist can make should be freely given; but when it comes, gentlemen, to instruments that are complicated and applicable to mechanical pursuits, then, when you attempt to step upon a man who patents a thing that is not only adapted to the dental profession, but hundreds of other purposes, you make a mistake. When it comes to instances where a man cannot make a thing himself, he will have to go to the manufacturer anyway. Take alone the electric mallet. Use can be made of it as a hammer for cutting stone, and for a great many other purposes. Was it right that I should simply give it away? Should I not go to work to improve and patent it, and then, if it was particularly applicable to dentists' use, could I not exercise the right the government gives me to put my money into it? Nearly two years expired before I patented either the dental engine or the electric mallet.

You all want to get everything as cheaply as you can. Now, when it comes to machines, to get these up to sell at anything like a low price, it must be done by the hundred or thousand. The more you order the lower the price will be. Surely somebody ought to be protected in their manufacture if you are to get these articles at a price fitting your pocket-book. I felt that, inasmuch as I had not the money to make these instruments as they ought

to be, it would be perfectly right to put them in the hands of the Dental Company, which would put its money in it, which was done after making them practically a perfect success.

A gentleman who was just from the dental meeting in New York had the good feeling to inform me that I had degraded the dental profession more than any other man in it, simply from the patenting of my inventions and selling them out to a manufacturer. I thanked him. He said my inventions were the best on earth, and I had sold them to him at a reduced price. Now, in the manufacture of these articles, if you made them yourselves you would soon find out the difference. They will not only be imperfect, but they never would be perfected. So, in my experience, if I had the ground to go over again, I would do the same thing.

The most potent argument I can give you as to the impracticability of giving away inventions when first made practical is in the history alone of my own inventions.

The anatomical articulator was given to the profession, and it took dentists twenty-eight years to grasp the facts demonstrated.

In eighteen years there has not been a valuable improvement placed on my dental engine, electrical or mechanical mallets. The high price paid me for them tells their value. What would have resulted had I given them? If dentists, with capitalists and manufacturers on their side, have not proven equal to the emergency, how long would these instruments have been kept in obscurity?

When we have in our ranks better mechanicians and more inventors it may be well to give away ideas and let others do the work of invention and improvement, and let many share the honors, which would be found "very easy." Any one entering into the manufacture of a new thing must go against *the tide.* Long years of fighting in introducing any new article must have backing. The experience of men in the past has led to laws which will secure not only an individual, but a nation, in the outlay made; and will do so for a number of years, until it will stand on its own feet and has arrived at manhood. If men and corporations could not have such protection, there would be slow progress, if really it would occur at all. Let any of you turn inventor, or even improver, and at once you will see whose ox is gored. You who know nothing of the practical workings of such matters cannot conceive what is involved in such work. Come to my museum of inventions of thirty years' duration, and you will tell me I have done right to secure myself against dentists and manufacturing companies, and made what I have in money and honors. If battling for a principle is

correct in any way it is doubly so here, from the long line of work, and in many fields, that it has been my fortune to have placed before me. The law of preservation demands that we shall look after and rear our own children. There is injustice in the workings of all laws. We find it so in patents. It will always be so. Let us divide it and give to the originator what is his due, and which he will have if he has the right spirit. Such communistic ideas are not in keeping with the democratic age, and with all your "Dental Protective Associations" you cannot down the spirit of an inventor. The wheels of time would stop and turn backward. Listen to me and for once stop to consider, and you will learn to be just.

These are the principal points I wish to make in regard to this in a business way. Another thing. Instead of making so much fuss about the Low crown and fighting it, as I told them the other night, they would do themselves infinitely more credit if some of them would look into the matter and bring out a better result. You would find very readily that you would not infringe upon it. Do you not know that there has hardly ever been anything devised but that somebody has improved upon it to a certain extent, and many supposed generic inventions blotted out?

DISCUSSION.

Dr. L. A. Faught.—I am very much interested in the instrument Dr. Bonwill has exhibited to-night. It seems to have only one fault,—the noise of the engine in packing the gold. There seems to be the same objection to it, in this respect, as to the right-angle hand-piece. Of course, the noise of an instrument of that kind on a very nervous patient would not be pleasant. It has excellent power, and undoubtedly does the work.

Dr. Bonwill.—The blow can be regulated. Much has been said about the noise of the mechanical mallet. Dr. Register thought that a rolling lug would do away with it. It is not, however, the contact of the projection on the wheel that makes the noise. A patient will tell you the noise is in the mouth itself where the plugger comes in contact with the gold.

Dr. D. N. McQuillan.—I want to say that to-day I put two people to sleep with the mechanical mallet.

Dr. Joseph Head.—I have frequently done the same thing.

Dr. W. X. Sudduth.—As I understand Dr. Bonwill, he will not give this plugger to the Society except the Society agrees to manufacture it and put it on the market.

Dr. Bonwill.—That is correct.

Dr. Sudduth.—In regard to patents, I think that I have made my position very generally understood on the subject heretofore, but will again say that I hold that the patenting of an appliance that has a use outside of dentistry, such as the principle involved in the electric mallet and such like instruments, is perfectly justifiable; also, that in case a dental instrument is complicated and requires the expenditure of capital to perfect and manufacture it, that in such cases the inventor has a perfect right to secure himself and those connected with him, or those to whom he sells his invention, from unjust usurpation of his or their rights as original discoverers and perfecters of said invention; and that a dentist so doing should not be considered unprofessional for his conduct. In the case of such an invention the manufacturer places a finished product upon the market,—an article of commerce that is ready for use, such as a dental chair, engine, mallet, etc. But in the case of the Low crown and bridge-work patents an entirely different condition arises. A principle or method is patented, and the profession is compelled to assist in its application, and a royalty is demanded for the use of what should be free as air. Such patents are an outrage upon the profession, and he who will stoop to enforce them should be ostracized by all regular societies throughout the country. In the same category should be placed all patents on simple contrivances such as can be made by the dentist in his laboratory, and all secret nostrums. This should be done not alone for the benefit of the profession, but for the good of the individual himself.

Dr. Bonwill.—What are your personal views in regard to Dr. Merriam's position,—that all men who do patent are to be ostracized from societies on the ground of unprofessional conduct?

Dr. Sudduth.—I have said that if dentists want to be recognized by the medical fraternity they must comply with the code of ethics of the American Medical Association. The professional phase of the question has already been discussed.

Dr. Bonwill.—Let me explain, and show how foolishly you are acting. Only a short time ago, at the last meeting of the medical men at Washington, Professor Harshley, of London, who has performed a great many operations, instead of feeling injured, or that the profession of medicine was lowered in its tone, had the kindness to say before the Society regarding the surgical engine which I left when I was on the other side, "This to one of your fellow-countrymen. Were it not for the surgical engine the operations that I have performed to-day could not have been very well performed." The best words I have received are from the medical profession.

Professor Gross did not consider it lowering at all to have me stand by and perform operations he could not do. Not only that, but he has placed a cut of my engine in his medical work, where he speaks of it in the highest terms. If medical men notice in that way patented articles, and also men of such note, why should men who are attempting to attach themselves to the medical profession have anything to say against it?

Dr. Tees.—If you will look over the old dental journals and examine the matter, I think you will find that many things that have been given to the profession and published are now hidden away in the dark. Had they been patented and manufactured by the inventors, dentists would have been benefited by them. But little is now heard of the lancet beak or subalveolar forceps which I invented and presented to the profession in 1875; while the liliput furnace, that I patented and made it a special duty to introduce, is now in use by dentists all over the world. Who are the most useful among us, men like Dr. Bonwill, or those who are trying to exclude such as he from our dental meetings? They have been trying to do it for the past thirty years; they have tried to have oppressive ethical laws adopted by the Pennsylvania State Dental Society and by the American Dental Association, but the majority are opposed to them; they are not tolerated by these societies. At a late meeting of the New York Odontological Society, which has been hitherto conservative, the subject was again agitated in an essay and discussion. In the June number of the *Dental Cosmos*, in which the proceedings are published, Dr. White presents an able and sensible editorial upon them.

Dr. Joseph Head.—I think in a case like this, when the subject of patents is being discussed, every dentist should frankly state his opinions; for when any class of persons is reproved by popular opinion, it is only just that the adherents of that class should all stand together and express their sentiments.

A man who invents methods, the patenting of which cripples dentists in following out their own individual operations at the chair, does a great injury to the profession at large; but the man who expends his time and energies in developing the profession by inventing articles which must be sold, and which can with profit be used by dentists, I think has not only a perfect right to be remunerated for his time, but also a right to honor for his industry.

Dr. James Truman.—As has already been stated, it is important that each one should give as clearly as possible the position he

occupies on this question. As Dr. Tees has stated, the subject has been a cause of contention for many years; but, for reasons easily understood, has recently assumed an aggressive character out of proportion to the matter involved. It is not a question of ethics, but is simply one of property, and it should, it seems to me, be discussed in that light and no other.

When an idea is conceived by an individual it requires time for its development. Months, perhaps years, must be consumed, together with a large amount of money. Now, this is capital invested as truly as in any other business. After thus investing his thought, skill, and means, is the profession to step in and say to this man, "You must deliver that to us. The code prohibits you from receiving anything but honor?" Such is practically the substance of all that has recently been said upon the subject. Is not the statement too absurd to be the principle of action of a generous profession?

If Dr. Bonwill were to give the right-angle plugger he has exhibited here to-night to the profession, the result would be that every manufacturer would have it without cost; but do you suppose the dentists of the country would get it one dollar cheaper than right-angle drills are at present sold? The matter would be entirely in the hands of the dealers, and neither Dr. Bonwill nor the profession would reap the slightest benefit.

The medical profession is constantly brought up as an example. I know of no reason why we should follow that conservative body; but in their case they make use freely of patented instruments, and I doubt if they ever give it a thought.

I, perhaps, go further than some on this question, inasmuch as I believe it not only the right but the duty of every man to patent anything coming within the scope of the law. The profession, as such, has no more claim upon the product of a man's time and skill than a person has to demand of him professional services without remuneration.

Again, I hold that for the security of the "*honor*" so much talked about, a patent is the one essential thing. Without it he will most assuredly be robbed of the credit of the invention, as Dr. Tees was of his, and hundreds of others besides. We must accept the morality of the world as we find it, and not as we would prefer to have it.

This is not only true of appliances, but it is true of ideas. Some men say, as Dr. Merriam has contended, that when a man has an idea worked out he should give it to the profession. I would make this voluntary on the part of the individual, but I would call to a

severe account the man who deliberately embodies an original idea in book form without due credit. If it were possible to get original ideas registered, I think it would be an excellent thing. The extent to which this sort of robbery has gone is not appreciated by the profession. A man gives the thought and work of months, embodying original investigations; the idea of money, or even honor, is not the incentive to action. He publishes the result in one of the journals. The next book that appears will in all probability contain his ideas, if not exact words, in its pages without quotation-marks, and on the title-page the author (?) will refer to this gentleman as one from whom he has freely quoted. The next author will quote the preceding writer as authority for his statement; and in the course of years it seems a puzzle for honest writers to find the original man who formulated the thought into actual practice. This has been done over and over again, and there has been no prominent original writer who has not suffered in this respect.

I hold, as I should have said before, that every man must do the work as it seems best to him. If he feel it right to patent an invention, he should be allowed the liberty to do so, and not feel it necessary, as Dr. Bonwill has this evening, to come before us for our endorsement. I do not think there is a member of our profession anywhere but could say of him that his work in our profession has been equal, at least, to any other man in it, and that he should receive every honor for it.

Dr. Sudduth.—As I understand it, the right-angle mallet is to be used in conjunction with the Bonwill hand-piece?

Dr. Bonwill.—That is correct.

Dr. Sudduth.—I think some action ought to be taken regarding this right-angle attachment. It is not right that it be passed by without some action.

Dr. D. N. McQuillan.—It seems to me that we have a chance now to put ourselves on record as a Society. Dr. Bonwill has very generously offered us this instrument, and if by any means we can put it before the profession, we ought to do so. Here is a chance to do what every one has been looking for.

Dr. Tees.—I move that it is the sense of this meeting that Dr. Bonwill shall use his own judgment in disposing of his invention. Societies often have considerable influence in these matters. The treatment of Low by the Illinois State Dental Society forced him to sell the bridge patent. His paper describing his invention was refused publication by the Society on the ground that the writer

was not "ethical." Instead of this kind of treatment we ought to encourage men with the right spirit.

Carried.

Dr. Sudduth.—I move that the thanks of the Society be tendered Dr. Bonwill for the instruments he has so freely given the Society this evening.

Motion unanimously adopted.

THE opening meeting of the Odontological Society of Pennsylvania was held in Justi's Hall, October 5, 1889. The following paper was read:

BLEACHING OF DISCOLORED DENTINE PRACTICALLY CONSIDERED.

BY DR. E. P. WRIGHT, OF RICHMOND, VA.

In the report of the proceedings of the March meeting of the First District Dental Society of New York there appeared a paper which was most scientifically discussed,—a method of bleaching discolored dentine, by Dr. Kirk, of Philadelphia, in which he gave the credit of inventing the apparatus, there used, to myself.

I do not design nor wish to make an elaborate or scientific defence of this method; that Dr. Kirk has done sufficiently; but I simply desire to set up claims for the restoration of discolored crowns to comparative usefulness by bleaching and filling, as against decapitation and crowning. To ratify these claims it is obviously necessary that certain prejudices, in the minds of a large class of practitioners, should be done away with.

First of all, our experience has proved, beyond question, that dentine can be bleached without subsequent re-discoloration. To this proposition, however, we allow consideration for that state of peculiar discoloration which is so familiar to us all, the color of which is from a light to a very dark yellow. The cause of this discoloration seems to be attributed, by the profession, to some defective or peculiar arrangement of the dentinal tubuli, which takes place during the stages of calcification.

When two years ago I began a series of experiments, with a view to the application of free chlorine and other bleaching agents to discolored dentine, I found such insufficient data to go upon, that my labors were crowned with poor success, and at the same time proving an expensive thing to my patients; as I candidly admit that I ruined several teeth by making them darker than they were before I began treatment. I trust, however, that the victims on the altar of science may be properly resigned, and have no malice stored up for me.

When we are able to make up our minds to the importance of preserving the tooth-structure, even when it is not so sightly as we might desire, and refrain from removing the natural tissue for a questionable substitute, we will have come to a wise conclusion.

With great respect for those who are madly rushing to porcelain teeth, I would say that they are doing the profession an injury, as there is no higher glory for one who professes the healing art than that of preserving the natural tissue. This tendency to porcelain crowns and bridge-work, in its many phases, is going to have, ultimately, the same effect upon the profession and the public that the introduction of a plastic base plate has had.

I would place the porcelain crown on the one hand, and the vulcanite base on the other,—they stand in the same relation to the advancement of our profession. We all regret the universal favor which has been accorded the vulcanite base, and rather look forward, I think, to the time when we shall have a reliable method by which we can retain the natural organs. Are we not taking a step in the right direction by aiming to accomplish this, and thus put a curb on that bent of our disposition to a retrograde movement?

A student of dentistry, looking through our journals, would be inclined, I imagine, to the impression that there was little else in dentistry than crowning and bridge-work. This is wrong; and while it is true that all plans are made clearer and plainer by discussion and illustration, yet too great emphasis on any theory is hurtful to the people.

In advocating the retention of the natural crown, at a sacrifice of symmetry and beauty, compared with an artificial one, we would avoid this error, desiring only to present to you the intrinsic merit of the question, stimulated by a firm conviction that, if we do our duty in preserving the natural organ, it will be a gain to the profession and keep us on the upper plane.

While it is an easy matter to bleach discolored dentine and preserve the natural crown in good shape, still it must be admitted that it is easier to remove the natural crown and substitute a porcelain one; but, as before stated, it is not well, nor is it to the interest of the highest aims of our calling, to consider too much the matter of ease or other minor effects, either to the patient or the operator; and as we are considering this subject from a practical point of view, we should look at it in that way, because, even though the individual efforts may not be so beautiful or, at first, so satisfactory from an æsthetic point, still we have satisfied our conscience, we are teaching our patients the importance of the natural organs, and encouraging an inventive and upward tendency among our brethren. We are maintaining the standard set for us by our great men; in short, we are doing the best we can.

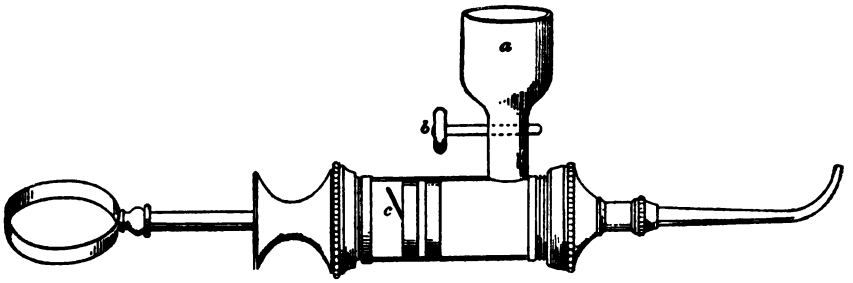
Before discussing the matter in the light of a valuable principle, we want to know what has been accomplished.

In the outset we state our positive belief that teeth properly treated—and certainly those amenable to the chlorine treatment—do not re-discolor; this assertion is based upon experience extending over two years; and, after many experiments, so far, I have not had a single re-discoloration where I have succeeded in bleaching. In my experience, the yellowish condition, of which mention is made at the beginning of the paper, has been very difficult of correction. It may be well to state that the present literature on the subject favors the idea that this latter peculiar discoloration can be removed by the use of dilute sulphuric acid, and there are many methods by which it is applied. My prejudice to sulphuric acid or any other acid known to act upon, in a deleterious sense, the organization of the tooth-structure has prevented me from experimenting, to any degree, in that particular line; therefore I cannot enlighten you upon the uses of sulphuric acid as applied to bleaching teeth. Saying this much of this peculiar discoloration, which is a yellowish mud-color, and of which we know so little in a remedial sense, and of the supposed activity of the agent (sulphuric acid), we pass on to the discussion of that class of discolored dentine with which we are familiar, and of which we know something positive.

Very lately, through the assistance of an eminent chemist, Dr. Froehling, I have succeeded in formulating a theory as to the cause of these peculiar discolorations. The value of this theory is questionable, and I hesitate to advance it. It may be well, however, to state in general terms that these discolorations can only be organic and perhaps of a fatty nature, and our failure to remove it heretofore has probably been due to the inadaptability of the method employed to destroy the fatty matter contained in the tubuli. I regret that this conclusion should not have been arrived at sooner. I have now, however, formulated a plan by which it seems there will be no difficulty in the future in thoroughly removing every particle of fatty matter from the tubes.

That you may understand more clearly the plan I wish now to place before you, I will hand around the apparatus to be used in the first steps towards the treatment of discolored teeth, as aforesaid. The instrument consists simply of an exhaust-pump, made on a small scale, of a simple retort connected with the barrel in which the piston works; the contents of the retort are controlled by a stop-cock which governs the flow of whatever chemical it may contain. The

agent recommended to be used is ether, chloroform, or petroleum ether (rhigolene), either one of which will act powerfully upon and dissolve the fatty globules. This apparatus must have its point in serted into a preparation such as is used in the hectograph, a material which is not affected by either of the three agents mentioned; it is,



however, easily acted upon by another of our favorites, ammonia, and thus *its* use is debarred.

I believe the hectograph composition can be made by putting pure glue in cold water, leaving it until it swells, draw off the water, melting it in its absorbed water, and mixing about six parts of the glue solution to one of glycerin. This compound is intended to be used after the rubber dam has been placed around the tooth and the tooth made dry, that the rubber dam, which is designed to keep back the moisture, shall not be interfered with by the action of the chemical agent employed.

The *modus operandi*, with the exception of the incompleteness of preparatory treatment, as will be shown later on, has been clearly described by Dr. Kirk, and published in the *Cosmos*. I shall therefore not take up your time in repeating it, but will close my paper with the proposition that ninety-five per cent. of discolored teeth can be bleached in from not more than one to three sittings of one hour each. Of course, preparatory treatment is necessary, and precaution also in regard to the use of oleaginous substances within the canal. If such have been used, from one to two sittings, close upon each other, will be required, and the oily substance previously removed as before indicated.

Of the two or three failures, strictly speaking, which I have encountered, I can attribute none of them to other causes than defective preparatory treatment. I think I see, judging from failures to bleach at all, a strong argument in favor of the theory advanced early in the paper,—to wit, malformation of the tubuli;

however, it would not be safe, in view of our lack of information and experience, to conclude that this is a fact, and thus not enter into the experiment suggested, and determine positively why we have failed in this class of discolorations. The use of chlorine gas, the agent we have employed until recently, we have concluded to be less effective than chlorine water, and shall in the future—and do now—recommend it to this body as the agent to be used in all bleaching operations.

I think that we have fallen into an error when we conclude that we can remove all that is necessary of the fatty matter by a simple application of some such agent as ammonia, borax, or bicarbonate of soda. This I believe to be impossible, and suggest the idea from the known bleaching properties of chlorine; and when we have experimented further, we will find that the elaborateness of our treatment will be confined to the primary instead of the finishing stages of the operation; at any rate, we will come down from the elaborate chlorine treatment to the apparatus mentioned earlier,—the object of which shall be the thorough cleansing of the tubuli of oleaginous matter, and when we have done this a simple application for a short time, within the canal of the tooth, of freshly-made chlorine water will be sufficient.

If you will take the trouble thoroughly to remove all fatty matters from the canal of an extracted tooth, and then immerse it in chlorine, you will find no perceptible change in its appearance even after hours of such immersion; if, however, this tooth is immersed in chlorine water, you will find that you have thoroughly and permanently restored its color.

There is no inducement for chlorine gas to penetrate to the ramification of the tubuli if the contents are dry; therefore, a very considerable force is necessary to force it through these ramifications, and the operation, so far as my experience goes, is necessarily uncertain, or at least unsatisfactory.

It is the periphery rather than the base of the tubuli that is to be treated, and we should not overlook the fact that the peripheries of the dentinal tubuli frequently extend into the enamel, making it that much more necessary that this zone should be bleached, as the nearer the labial surface the tubuli extend the surer they are to show themselves through the translucent enamel.

DISCUSSION OF DR. WRIGHT'S PAPER

Dr. E. C. Kirk.—I feel that the thanks of the society are due to Dr. Wright for the trouble he has taken in coming to our meeting

and giving us the valuable and practical points which he has presented in his paper. I am especially interested in one point he has made,—viz., the necessity for the complete removal of all fatty matter from the tooth-structure previous to the application of the bleaching agent. While I have not experienced great difficulty in restoring teeth of a bluish tint to a normal color, I have found—and I have no doubt that it is the common experience of all who have made the attempt—that it is well-nigh impossible to get satisfactory results in bleaching teeth which are of a dark yellow or brown tint; and this result obtains regardless of the agent or method employed, for, I think, I have tried them all. It may be—and indeed it seems likely from the experiment reported by Dr. Wright—that a complete removal of all fatty matter by the method he suggests, or one of a similar nature, may prove to be the solution of the difficulty in these obstinate cases.

A special point made by the speaker, and one which cannot be too strongly emphasized, is the necessity for continuing the treatment until the bleaching agent has penetrated to the ultimate ends of the dental tubuli, otherwise a recurrence of discoloration will result. With regard to the choice of use between dry chlorine and its aqueous solution, it is well to bear in mind that, in general, chlorine bleaches best in the presence of moisture. It does not act directly on the coloring matter, but indirectly, by virtue of its affinity for hydrogen. In the presence of moisture it seizes upon the hydrogen of the water molecule, liberating its oxygen, which in its nascent state is the active bleaching agent.

Dr. Head.—When the fatty matter is to be removed, is your cavity moist, or dry?

Dr. Wright.—I do not think it of much importance whether it is wet or dry. The obstruction to the passage of the chlorine water, from the centre to the periphery, must be removed. This I believe to be the fatty matter. The other day I took some hygrometric material, placed it around a tooth, exhausted the native air by the piston, and put in four or five drops of ether, which, with the loss, amounted to perhaps two drops, and by means of the chlorine the tooth was made beautiful and white. The apparatus which has been shown is simply a means of putting the tooth in a vacuum.

The most important part is the removal of the fatty matter; after this is done, pack your cavity with cotton saturated with distilled water, and with your syringe inject the chlorine gas, and you have chlorine water at work.

Dr. Head.—I know if you drop a dry tooth in ink it will be colored only on the outside; but if the tooth be previously wet with water, it will be colored through and through. I thought this might make some difference in the action of the chlorine.

Dr. Woodward.—Is the apical foramen open, or how do you fill it?

Dr. Wright.—At the apex I put gold to one-third the distance; then gutta-percha; scrape out as much dentine as the tooth will allow, and then proceed. Always scrape out a little more than you think is enough.

Dr. Sudduth.—Dr. Wright has given us clinically what I have demonstrated microscopically in the laboratory, and my observations coincide perfectly with his theory. The histology of the part, as I have demonstrated for fifteen years, shows that coloring-matter can be extended along the living fibres. On the other hand, I have taken a tooth and made a section of it, immediately following an inflammation of the pulp, and found a condition of fatty degeneration in the dentinal fibrillæ. When this is present the finest tincture will not succeed in coloring the periphery of the fibres; but when the fat is removed by ether, the staining shows to the very outside.

Dr. Truman.—I confess to being much interested in the paper and the remarks of Dr. Wright. I think his process marks an advance, and should be permanently brought forward, so that all may become familiar with it. I imagine very few here have a practical idea of its form or application. I have had so much to do with bringing this subject before the profession, and have had to combat so frequently unthinking prejudice, that I feel disinclined to say more upon it.

Like all other processes, it has had its period of origin and subsequent development, its time of crude ideas and more perfected modes; but the education of dental thought in this direction has not kept pace with improvements.

The professional mind is no more prepared to-day to believe that the bleaching of teeth is a part of operative dentistry than it was twenty-five years ago, when I first attempted to prove its importance. This is due, doubtless, to many reasons; but prominently to the one fact that but few will observe the rules laid down for their government; and, consequently, the result does more harm than good, the process shouldering the responsibility of the failure. Hence I welcome an apparatus that eliminates, to a large degree, the personal equation.

The use of chlorine for bleaching is not new; indeed it is the oldest process; but its irritating effects made it impossible to use. Dr. Wright's apparatus overcomes this entirely, and hence my reason for some degree of faith in it. I have not seen it in operation but in one case, and that was one of the worst possible. This came into my hands for treatment after it had been tried by some inexperienced operator. I found it entirely black. Suspecting the cause of this, I proceeded to bleach in the usual way, and soon returned the tooth to a deep yellow tinge. This the patient reported as the original shade. Satisfied that this color could not be changed, I handed the case to a professional friend to try his plan. This resulted the same way. Dr. Wright, happening in the city at the time, made a fourth attempt, and the temporary result was remarkable; but, unfortunately, it failed as the others had done. This case is cited in detail not to antagonize the process, but to emphasize the difficulties that must surround all attempts at bleaching, and the importance of giving more attention to it. We have yet to learn whether speedy bleaching by Dr. Wright's process will be as lasting as by slower modes. If this proves to be the case, then there is no question but that we have in this plan a more effective mode than has heretofore been brought to the notice of the profession, and one that is, at the same time, so easily applied and is so positive in its action, that it would seem to have a future of usefulness before it. I, however, do not believe it or any other process will change the yellow color of teeth. These constitute but a small proportion, the blue predominating.

Dr. Jameson.—Can one-half or one-third be bleached?

Dr. Wright.—More.

Dr. Tees.—How often is the apparatus used before the bleaching is done?

Dr. Wright.—Only once.

Dr. Tees.—How about the tooth of which Dr. Truman spoke?

Dr. Wright.—As I said before, there are some teeth that cannot be bleached; and I think the doctor admitted that this particular tooth had resisted all other efforts to bleach it. But I find that ninety-five per cent. of all teeth may be bleached.

Dr. Tees.—Will these ninety-five per cent. remain white long?

Dr. Wright.—I can show you cases that have been bleached more than eighteen months, and they are just as white now as when first done.

Subject passed.

INCIDENTS OF PRACTICE.

Dr. Place.—A young lady came to me suffering periodically with severe pain through the nerve which supplies the first and second lower bicuspids on the right side. She had been suffering for over a week. It comes every half-hour or fifteen minutes, and lasts five or ten minutes. While it lasts it is excruciating. A careful examination of the mouth showed the wisdom-tooth and second molar in place, the sixth-year molar having been extracted years ago. In the wisdom-tooth as well as the twelfth-year molar there were large amalgam fillings. The bicuspid teeth are entirely sound, with no sign of decay between them. I took an instrument and tapped it lightly on the wisdom-tooth, also on the twelfth-year molar, and in neither could I get a response. As soon as I tapped the second bicuspid she felt a slight pain. I applied the rubber dam on the wisdom-tooth, to see if the nerve was alive, and found it was; likewise that in the twelfth-year molar and that in the bicuspid,—all alive. I hardly knew what course of treatment was indicated. I applied to the gums iodine and aconite, and she is now under the care of a physician, who, I suppose, is treating her with quinine. If there is better treatment I would like to use it. By pressing on the nerve at the mental foramen, there is a tendency to relieve the pain. It was used several times when the pain was very severe, which gave temporary relief.

Dr. James Truman.—Are the teeth very dense? If so, there might be granular deposits in the pulp. I think I should drill into one of these bicuspids.

Dr. Bassett.—Is it not possible that this trouble comes from the wisdom-tooth,—from the amalgam filling? The trouble might be reflected forward into the bicuspid. I have seen one or two cases where this has been the result, and it may be so with this case.

Dr. Kirk—I think the fact of cold relieving the pain wonld favor the idea of the trouble arising from pulp granules.

THE Odontological Society of Pennsylvania held its regular monthly meeting in Justi's Hall, November 2, 1889. The following paper was read:

FERMENTATION: ITS CAUSE AND EFFECTS.

BY DR. ERNEST LAPLACE, OF PHILADELPHIA.

GENTLEMEN,—All that lives must die; and dying, disintegrate and resolve itself into elements that enter into new cycles of usefulness. This phenomenon of universal disintegration must have aroused the interest of the human intellect from the first moment that it reached such a state of perfection as led it to inquire into the causes of things. If this disintegration did not exist, the matter of organized beings would encumber the earth, and the law of perpetuity of life would be compromised. A great phenomenon presides over this work; this phenomenon is fermentation.

Our forefathers may have been savages; but they were clever and observant ones. After organizing their own rude arts, they turned beasts into servants; they founded agriculture; planted the grape. This fruit was surely antediluvian, for we are told that Noah, on leaving the ark, planted a vineyard, drank of the wine, and experienced its consequences. But though wine and beer are as old as history, it was not until within the last few decades that anything positive has been known as to the true mode of their formation. Our knowledge in the matter has been almost identical with our knowledge of medicine,—that is empyrical. By this is meant that we had observed the facts, aside from the principles which produce them, and which are essential for a true understanding of them. In a word, when light dawned upon the true secret of the manufacture of beer, by the immortal discoveries of Pasteur, that same beam spread itself over the whole realm of medicine; was the light of regeneration to the noblest of sciences.

The brewer learned from long experience the conditions, not the reasons, of success. Often, however, the brewer's beer has fallen into rottenness without any accountable cause. It is the hidden enemies against which the physician, like the brewer, has had to contend that recent researches are dragging into the light of day, thus preparing the way for their final extermination.

While still a young man, Pasteur, who was then a professor of chemistry in the École Normale, of Paris, was attracted by a note of the German chemist Mitscherlich, in which he said to the Academy of Sciences: "The tartrate and paratartrate of soda and ammonia

have the same chemical composition, the same crystalline form and angles, the same specific weight, and the same double refraction. Dissolved in water, the refraction is the same. But the dissolved tartrate turns the ray of polarized light to the left, whereas the paratartrate is *indifferent*. But," adds Mitscherlich, "the nature and the number of the atoms is identically the same." Pasteur, who was then but twenty-five years of age, discovered that the crystals which turned polarized light were not symmetrical. He noticed that all products of organic life were dissymmetrical, such as starch, quinine, strychnia, etc., while all mineral crystals, or products of the inorganic world, were symmetrical. He immediately suspected that tartrates were organic,—that is, connected directly or indirectly with life. It was a well-known fact that a German manufacturer of chemical products having thrown away some impure tartrate of lime, mixed with albuminoid materials, this had fermented, giving rise to different products. Pasteur reproduced the fermentation in the following way: Taking some tartaric acid, he added a certain amount of albuminous material, and placed it in an incubator. When fermentation had taken place, Pasteur found innumerable small living organisms, and after the process had stopped he polarized the liquid, and found that, whereas before fermentation the polarization was to the left, it had now turned to the right.

His suspicion was realized.

Hence, this sudden change of the direction of the ray of polarized light was accompanied by a great development of small living organisms during a process heretofore known simply as fermentation. This was the first hint ever gotten of the influence of a living micro-organism upon organic substances. This micro-organism was not present apparently when the mixture was placed in the incubator, and now it existed in swarms in the disintegrating mixture. They surely grew during the fermentation.

Up to this time the most incomplete notions had been entertained as to the true cause of fermentation. *Liebig* said "it was an acidification of albuminous substances when in contact with air;" *Gay-Lussac* thought that the oxygen of the air was the causative agent, for he had noticed that wine had turned sour from being poured from one vessel into another; Berzelius and Mitscherlich said that ferments acted by catalysis,—that is, by their presence; Schwann and Cagnard Latour noticed that a living rounded body was present in the manufacture of beer, but it did not occur to them to ascertain what part was played by this organism. As soon as the

malt is mixed with hops it is boiled and allowed to cool; this infusion is called the wort, and that is placed in vessels with but one aperture open to the air. Here it is mixed with the yeast. Soon after a brown froth forms on the surface, which is really new yeast, and issues from the aperture falling like a cataract into troughs prepared to receive it. Whence is this new yeast? Weigh it before and after. The brewer sows ten pounds and he collects fifty pounds. Shall we say that this is spontaneous? Are we not reminded of the seed that has fallen in good soil and brought forth fruit fifty- or a hundred-fold? In fact, this seed can be seen budding under the microscope before our own eyes. It is a minute plant, the torula cerevisiæ. This marks a distinct epoch in the history of fermentation. But Liebig was loath to accept the growth of this plant as the cause of fermentation, and maintained that its life had nothing to do with the process, that it was a purely chemical one, and that it was the chemical nature of yeast, not the fact that it was alive and could develop life, which produced fermentation. In a memorable demonstration, Ludersdorf proved the error of Liebig's assertion, and that yeast acted as a ferment because of its organized or living character. He destroyed the cells of yeast by rubbing them on a ground glass plate, and he found that, with the destruction of the organism, the chemical nature remaining the same, the power to act as a ferment disappeared totally. No experiment could possibly be more conclusive.

But in the manufacture of wine no yeast is added. The grape is pressed, and the juice ferments after a short while. The torula soon make their appearance, however, and where do they come from? If the filtered grape-juice be boiled, so as to destroy the germs it contains, and be put in germless air, it will never ferment. All the material for spontaneous generation is there, but the life both in the grape-juice and the air being destroyed, no new life can be produced in the shape of fermentation.

Pasteur has pushed this demonstration still further. The grape is sealed by its own skin from contamination by the air. He contrived a way of extracting the juice without its touching any contaminated substance and placing it in pure air; it did not ferment; then taking the skin of the grape and brushing the delicate grayish dust upon this non-fermenting juice, fermentation soon developed, and the yeast-plant appeared in great abundance; proving that the grape carries its yeast upon its own self. For thousands of years, therefore, the wine-grower has done unconsciously what the brewer does purposely.

The germ of the yeast-plant exists in the air, but not in quantities sufficient to insure rapid fermentation, such as the brewer desires, hence the brewer puts in a quantity himself. Pasteur has defined fermentation as life without air. These germs live on oxygen, as we do, and give off carbonic acid gas; but they do not take their oxygen from the air, they take it from the substance upon which they grow; hence they do not need the oxygen of the air for their development. Hence fermenting substances are placed in vessels with but a small aperture to the open air, where the yeast imbibes oxygen and pours forth carbonic acid. Where does it get the oxygen? It is wrenched from the liquid upon which it grows; liberates carbonic acid gas, and leaves the liquid product as our familiar alcohol.

And in the same way exposing alcohol to the action of the ferment known as the mycoderma aceti, acetic acid will be the result.

The air is full of germs of ferments differing from the alcoholic leaven. Expose milk to the air, and coagulation will take place; small globules of butter appear,—the butyric acid fermentation. Within a short while larger organisms are seen wriggling in swarms through the preparation. In curdled milk are found other organisms linked together, as beads on a string,—that is the lactic acid fermentation. Examine putrefying milk, and it will be seen to swarm with millions of small and larger germs, showing wonderful alacrity of motion. Keep your milk from the influence of the atmosphere, or boil it so as to kill the germs within it, and it will remain sweet, the germs being destroyed. Expose meat to the atmosphere, and it will soon putrefy; it will swarm with the germs of putrefaction, and will soon stink. Keep the germs away, and it will not putrefy. Thus we begin to see that within the world of life, to which we ourselves belong, there is another world requiring the microscope for its discernment, but which, nevertheless, has a most important bearing upon our welfare.

Gathering these facts together, and analyzing them, we see that there are two elements always in action, a seed and a soil: the seeds are floating continually in the atmosphere about us; the soil is the particular substance upon which these germs fall, and at the expense of which they grow. It follows also that the greatest analogy exists between these various germs in the atmosphere and the seeds of various plants that may be wafted by the wind from one spot to another, and which develop when they happen to fall upon a suited soil.

Another fact is that, just as when you sow corn, corn is reaped

and not barley, so each particular germ grows its particular kind. Supposing you take a handful of seeds of various flowers, and sow them in the same soil, then the different plants will grow alongside of one another. So also, if various sorts of germs have access to the same soil, they may grow plentifully together, as takes place in putrefaction, where germs of many kinds are seen growing and decomposing the soil upon which they grow, liberating not carbonic acid, as in fermentation, but sulphuretted hydrogen,—the foul smell of putrefaction.

All germs will not grow on the same soil, just as all seeds will not grow in the same ground; some plants being indigenous to some countries and others to different climates. But a very astonishing fact is that one germ, after developing in a particular soil, may leave that soil in such a state as will render it favorable to the development of a germ which could not have developed there before. Such is indeed the case with the mycoderma aceti, which could not have developed in the sweet solution. First, the yeast-plant developed there, changing the sugar into alcohol, and now the mycoderma aceti, falling into the alcohol, grows abundantly, changing this alcohol into acetic acid or vinegar.

The most important and practical portion of the whole knowledge of the nature and development of micro-organisms is the study of the changes incident to their growth in the soil upon which they develop. The yeast-plant left the sugar changed into alcohol, whose chemical nature and physiological effects are quite different from sugar. The mycoderma aceti has changed the alcohol into vinegar, whose chemical nature and physiological effects are vastly different from alcohol. Likewise the lactic acid germ has produced in milk, which was once sweet, a substance (lactic acid) having corrosive properties, and which curdles the milk.

This new product, which results from the decomposition incident to the development of a germ, is called in medicine a ptomaine. When germs are absorbed from the atmosphere and produce certain diseases, the albuminoids are decomposed within us, and this ptomaine or fermentative product is the chemical poison formed, which, being resorbed by the economy, produces those physiological symptoms characteristic of a disease.

And would a substance putrefy without the action of germs? In other words, is there such a thing as spontaneous generation? Tyndall's and Pasteur's admirable researches have set this question at rest. One will suffice. Having made veal broth, Pasteur placed it in a round vessel, with but a small aperture. This was raised to

a temperature of 115° C. for half an hour, so as to destroy all the germs within it, and the tip end of the flask was soldered, so as to prevent further air from coming in contact with the broth. A number of flasks so treated were placed aside. I have one in my possession thus prepared, many years ago, by Pasteur himself, and its contents are as pure as on the day of its preparation. This shows conclusively that by heat he had sterilized the liquid and interior of the flask, and, having soldered the end of the flask, thus preventing any germs of the atmosphere from having access to the fluid, there was no possibility of life developing in it; hence it remains pure, and is likely to remain pure indefinitely.

Now, this simple experiment was a master stroke of genius, for on it is founded our whole system of modern pathology and hygiene.

Do we wish to stop fermentation, putrefaction, contagious and epidemic diseases, we must repeat Pasteur's experiment,—sterilize first; then prevent the germs from having further access to the parts thus purified.

Strange to say, this process of purification was applied to the canning of goods before it was practically applied to scientific purposes. In fact, canned fruits of all sorts are prepared exactly after the manner of Pasteur's broth experiment. They are raised to a high temperature and kept in air-tight vessels. And what occurs when canned goods become spoiled? Simply, the germs of the air have gotten into the goods, either through some small aperture in the vessel or sufficient heat was not applied at first to destroy them.

Lister, in England, was the first to make a practical application of this to suppuration in wounds. He saw the analogy between the foul smell of a suppurating wound and the process of putrefaction, and concluded that, should he succeed in destroying the germs which had started this putrefying process, and should he prevent further germs from having access to the wound, this putrefaction would cease and the wound heal kindly without suppuration. This he did by sterilizing the wound. There are two ways of sterilizing: (1) by heat; (2) by chemical agents: carbolic acid, sublimate, etc., which have the property of destroying the vitality of most micro-organisms; and when used in proper strength, do so without impairing the tissues with which they come in contact. The wound is then covered with several layers of cotton that has been sterilized or purified by heat,—and this prevents the germs of the air from having further access to the wound; for as these germs fall upon the outer layers of the cotton, they are caught by the meshes of

the small cotton fibres and are not allowed to get any nearer the wound; during this time the normal and unimpeded process of repair goes on, and healing takes place without suppuration or putrefaction produced by germs. And by this glorious discovery Lister has blessed humanity with a reduction in mortality from major surgical operations; a mortality reduced from fifty per cent. before the days of antisepsis to two or three per cent. at the present day in the best-conducted hospitals. Besides, it has widened the domain of surgery, bringing to the surgeon success in such operations, in which he could not hope for success should suppuration take place.

Applying these same principles to dental surgery which is a special branch of general surgery, we are struck by the frequency of processes of putrefaction or fermentation in the mouth. And why? Because the germs of the atmosphere, which we constantly breathe through the mouth, lodge upon some remnant of food buried in the sulci, fissures, and proximal surfaces of the teeth, and find there a suited soil, accompanied by heat and moisture; these germs develop and cause putrefaction, as evidenced by the foul odors from the mouth. Besides putrefactive processes, a fermentative process also may take place in the presence of sugar which produces a corrosive element that destroys the enamel. The germs sink into this impaired spot, and the same deleterious agent being generated there, the process of decay attacks the dentine, the pulp, and an extensive cavity follows. Such being the case for a healthy tooth, well paved with enamel, the process is a much easier and more rapid one when through some accident a mechanical abrasion already exists.

To the honor and credit of Professor W. D. Miller, of Berlin, be it said that he was the first to discover that the corrosive substance so deleterious to enamel, and which results from fermentation in the mouth, was lactic acid, which enters into composition with the calcium salts of the tooth, producing a lactate of lime.

This being the case, as a student of pathology and practitioner in surgery, I conjure you to apply to your special branch of surgery the principles of antisepsis that Lister has applied to general surgery, vouching that you will meet the same grand success. To reach this end, sterilize, and prevent the further access of germs to the parts. Sterilize with the acid sublimate solution, destroying the organisms at one sitting. But when the pulp is dead use the heated platinum broach in the root-canals, then use the antiseptic solution, which will penetrate the minute nooks of the cavity, and destroy those few germs that have perhaps escaped the heat; finally, plug the tooth

with aseptic or antiseptic filling. And, gentlemen, as a physician, knowing how many general disorders, gastric and others, are caused by germs that found originally a brooding-place in the mouth, I implore you to give this question of oral disinfection your most scrupulous attention, feeling confident that a rational and persistent use of the antiseptic solutions now within our reach will afford you the fullest satisfaction, for in your treatment you will meet the same glorious success as is achieved in surgery as practised at your doors.

And now, having reviewed the various phenomena of fermentation, we see that in the eternal laws of the universe fermentation was destined as a power for good, and, like electricity and steam, it vastly benefits our existence, if only rightly understood and maintained within its proper bounds; that most of the harm to humanity resulting from fermentative processes is due to our still incomplete mastery of its laws; and that with the present strides of science, we will completely overcome those micro-organisms or fermentative agents that are deleterious to man and his surroundings.

Such is the triumph of the scientific age in which we live, that has disclosed a world about us which we knew not of; a world of beings consisting of enemies as well as benefactors, in constant and intimate relation with each of us.

We know of numberless stars above, infinitely large, but this newly-discovered world of infinitely small beings, its laws and purposes, is to me not a lesser index to that Power, the Author of them all,—

> "That God which ever lives and loves,
> One God, one law, one element,
> And one far off divine event
> To which the whole creation moves."

DISCUSSION OF DR. LAPLACE'S PAPER.

Dr. Sudduth.—I would like Dr. Laplace to answer a few questions which will bring out points which may not be as clear in the minds of some as they should be. First, I would like to know what effect the "alteration of the soil" has to prevent the growth of these germs?

Dr. Laplace.—I can only say that it is a fact which has been observed from the time Jenner inoculated cow-pox against small-pox; but just why this should render the soil unfit for their growth I am unable to say.

Dr. Sudduth.—Might there not be a slight change in the albumi noid substances of the body?

Dr. Head.—Might not the weaker microbe act on the stronger as a restraint?

Dr. Laplace.—As an illustration, suppose two young men, brothers, both in health, are exposed to the same infection. One from exposure contracts pneumonia. After the one has recovered from the pneumonia they are again exposed, this time, however, to the germs of tuberculosis. The germs which before fell harmless on the soil of each of their lungs now find suitable soil in the lungs of the one who has had pneumonia, and take root and grow, while they are still harmless to the one who has never had pneumonia.

I could entertain you a good while with many of the experiments of Pasteur. But as this one illustrates the point in question I will relate it. Pasteur was told that a chicken could not be inoculated with anthrax or splenic fever. In experimenting with the cultures of the anthrax bacillus he found that, when grown, at a temperature of 42° C., these germs were not virulent; but when cultivated at 37° C., they were highly virulent to its growth. He then took the temperature of a chicken and found it to be 42°. He then went down to the Academy of Science, and took his chicken and a basin of ice-water. He plunged the chicken into the ice-water until its temperature was reduced to 37°, and then inoculated it. In twenty-four hours the chicken was dead from anthrax.

Dr. Kirk.—Suppose you have treated a tooth thus theoretically antiseptically, and some time—six months or more afterwards—there develops in that tooth an alveolar abscess, then would you say that some germs had been left there, or, that the germs had since been introduced?

Dr. Laplace.—We know that germs will travel through mucous membrane through the stomata or little mouths of blood-vessels. They may get there in this way or perhaps be carried direct by the blood-vessels, in some diseased state of the blood, such as erysipelas or pyæmia.

Dr. Faught.—Why does it select this particular tooth and not another?

Dr. Laplace.—I can only give you the reason which I gave before, that of lowered vitality. To have a correct idea of the process, one must take into consideration the histology of the part. When a part of the body is irritated by the germs, more blood is sent to that part, and the white blood-corpuscles pass through the vessel walls and attack the microbes, and, if in sufficient numbers

and strength, destroy them, and the part regains its health. If, however, the germs are in too great numbers, they will gain the upper hand in the deadly strife, and disease will follow. A Russian pathologist, in looking at this conflict, discovered the microbe inside the white blood-corpuscle, and from this fact named them *phagocytes*, —the Greek to eat. When a great number of white blood-corpuscles have been thus destroyed by the action of a local irritant, chemical or a living micro-organism, and are retained in that special locality in a certain amount of fluid, we have the pathological product commonly known as *pus*.

Dr. Sudduth.—Will the doctor give us some idea of the best antiseptic, and how used?

Dr. Laplace.—The first antiseptic used was carbolic acid. This was discarded in favor of the bichloride of mercury, which Koch, in 1882, found to be destructive to the life of the anthrax bacillus in the proportion of 1–1000,—that is, in a watery solution of this strength the germs would be destroyed. But when the mercury was brought in contact with the albumen of the tissue of the bodies, there was thrown down a heavy precipitate of the albuminate of mercury, which rendered the solution inactive. When in Koch's laboratory, taking a subject for special investigation, I undertook to find some way to prevent this deposit and keep the solution active. I took this deposit and planted therein the germs of suppuration, and they grew and thrived, thus proving the uselessness of it where this deposit was. After a long series of experiments, I found that by adding five per cent. of acid to the solution, I had not only solved the question of preventing the deposit, but had rendered the solution much stronger and efficacious.

Dr. James Truman.—From the time when Senwenhoeck, in 1680, found that yeast consisted of globular particles to the period when Schwan and Latour independently proved them to be vegetable cells, was a period of less activity than that which followed; yet it was the commencement of that greater work that has been so prolific in results in more recent times.

The views of Schwan naturally led to opposition, and Leibig's molecular action theory held its place as the most prominent, and, at the same time, most difficult theory to combat. When Schroeder proved that he could filter out the spores from the air, another advance was made, and rendered possible other steps in the investigation of this subject. Bastian aided materially in this labor; but his spontaneous generation theory has not found a place, and he failed to sustain the views of Leibig that the molecular movements

were the cause of fermentation by adding on his own, that they actually became vital. From this period to that more recent, when Koch proved the existence of the tubercle bacillus, there has been continued progress, and the germ theory of disease has ceased to be a speculation. The theories brought forward from time to time, to combat it have fallen into deserved oblivion.

The address and the remarks of Professor Laplace this evening abundantly prove the thoroughness with which the whole subject of fermentation has been treated by those to whom we are most indebted for its elucidation. To us, as dentists, this subject appeals with daily increasing force. We are constantly brought in contact with conditions that must be intelligently met, and it is only by a satisfactory knowledge of fermentation and antisepsis that these can be properly met. To Professor Miller we owe a debt of gratitude that he has, unquestionably, solved the problem of dental caries, and his labors in investigating the ferments of the oral cavity have shown the necessity for an equal degree of thoroughness in our operations with that which made Lister's name famous in those of general surgery.

When it is fully recognized that the mouth is, without doubt, the culture place for many pathogenic forms, and that many of the zymotic diseases have their genesis therein, more attention will be paid to its condition by general practitioners than is given at present. When the dentists of to-day appreciate the possibilities of fermentation, they will govern all their operations in the mouth with a care as to possible results from infection. The time is certainly not far off when prophylactic measures will be studied with special reference to the mouth and its secretions. Efforts will be made to destroy these germs as they enter this vestibule of the entire organism, and prevent them from beginning their insidious and poisonous work. That this is to be the labor of the future I have no doubt. That it will, in degree, stamp out many forms of disease I am equally well satisfied, and the time will, in my opinion, most assuredly come when we will know less of the destructive work of the tubercle bacillus than we now do, but this will be accomplished in advance of pathological conditions.

Dr. Sudduth.—I would say for the benefit of those who are not aware of the fact that tablets of the acid sublimate, put up after Dr. Laplace's formula, are to be had at Mulford's drug store.

THE Odontological Society of Pennsylvania held its regular monthly meeting in Justi's Hall, December 7, 1889. The following paper was read:

RECOLLECTIONS AND IMPRESSIONS OF MY VISIT TO THE AMERICAN DENTAL SOCIETY OF EUROPE, AT PARIS; BRITISH DENTAL ASSOCIATION, AT BRIGHTON; AND THE FIRST INTERNATIONAL DENTAL CONGRESS, AT PARIS.

BY W. G. A. BONWILL, D.D.S., PHILADELPHIA.

As your minister accredited to these foreign courts, it is expected that I shall relate whatever of interest came under my observation.

It is very proper that delegations should be sent on all state occasions, in order that an estimate may be drawn of just how nearly related we are to those who are so infrequently in communion with us. Nothing else has promoted the well-being of professions, trades, and societies so much as the close relations of intimacy gained only by personal contact with these great bodies.

That we, especially, should know our brothers across the water more intimately, as a body, is evident, for it would promote a better feeling than now exists towards "American Dentistry," and materially enhance and elevate the broad standard of dentistry which is so needed to give all a higher social status among ourselves and among the classes for whom we operate. The dental journals have carried every phase of work and thought from all parts to every hamlet of the civilized globe, yet I know, from this summer's experience, that we are far from that goal which every true man could desire,—the status vouchsafed to all the other learned professions,—and which we cannot hope to reach until we can learn to treat each other individually and collectively as is becoming gentlemen; until we can learn to estimate a man by what he has done, and extend to him the honor due him; until we can forget that science knows no nationality; then dentistry will succumb to the in evitable, and divest herself of her swaddling-clothes as a trade. I did not know when I left here the animus against the "American dentist;" but it did not take me long to sniff it when I reached England.

Personally, I was treated with the greatest consideration

Everything was done to make my visit honorable and pleasant. At my clinics, at Brighton, the crowd around me was dense, and I was told—in fact, I could see and feel the spirit animating nearly every one—that no closer attention to my speeches nor demonstrations could have been given. To see such an anomaly as packing —welding—Abby's soft foil with smooth oval points was beyond belief, and they were as incredulous as my own countrymen after twenty years' teaching.

When I attempted to demonstrate the extraction of a tooth by rapid breathing the crowd was so great as to overpower my patient with fright, and he could not rapidly breathe. But I demonstrated it upon myself, to their satisfaction, by their pulling my beard and hair, pinching, and placing finger on the conjunctiva of my eye.

But, aside from all this personal respect and attention given me, I saw clearly that when the reports were made from the dailies, no mention was made of my operations, nor of me further than that "Dr. Bonwill, a leading American dentist, was present at the meetings." Another thing: before I went to Brighton, I found that my clinics were not down on the manuscript programme, although I had stated in advance that I would be present, and would assist in every way I could to make the meeting profitable. It was finally added.

What first led me to suppose that there was an undercurrent of feeling against the "American dentist" was, when I proposed to go into the American Dental Institute, a branch of which was at Brighton, in order that I could see what American dentistry was doing to honor its country, I was begged not to do so, as the next day there would appear in the circular, published regularly by the Institute, "That the celebrated Dr. ——, an American dentist, had honored it with a call;" and it thereby would give status to its nefarious business and work to the detriment of the English dentist.

This American Institute, I learned, had several branches, and was run by a Jew who was not a dentist, but employed many young American dentists to give the most approved style of operations in every department; and they resorted to extensive advertising and special circulars as operations done only by the "advanced American dentist." Not wishing to give offence, I did not enter their portals. Notwithstanding the novelty of all I had demonstrated, this treatment could but confirm me now in my conjecture that I must suffer silent praise on account of the

outrageous conduct of many men who were posing as American dentists.

To make it still more noticeable, I found that I was not down on the banquet programme for a speech in reply to the toast of "Visitors." Now after such personal attention by the best men in London, and at a banquet given by the dentists alone of Brighton, where I had already received the most honored seat, I was somewhat doubtful about accepting the invitation to the grand banquet. It was so very noticeable, I could but feel that there was some mistake, and that it would be corrected at the last moment. This was not done. At the banquet they gave me, next the officers, the most honored seat. All went off well until the visitors were called upon to reply to the toast. The French delegates were, with another visitor, called upon,—none of whose names were down for a speech on the programme; but my name was not called by the toastmaster. At this juncture I was boisterously called for by a large number. It was an embarrassing moment to me. I could feel that the affair was intended to be not an insult to me, but a silent rebuke, at my expense, to the "American dentist."

I had already made a few remarks, at the opening of the meeting, extremely complimentary to the English dentists: That I was pleased to meet them; and, while I came to drink from their fountain of experience and knowledge, I should feel that my visit had been in vain if I could not give some recompense in what I would demonstrate of the class of operations I was personally doing in my office. This was very palatable to them, and yet it was not noticed publicly, except as a "characteristic American speech." At the banquet, to be sure that it was not aimed at me, I, while again using quite the same language and sentiments as previously made, spoke of what I had seen already in England, Germany, and France, as to the materials used, finding that plastics were the rule and gold the exception; and added, that *we* in America had concluded that there was nothing so well calculated to give to every operator such dexterity in manipulating plastics as excelling in the use of gold in contour work under both hand-pressure and the mallet. By the use of "we" I thought I would be sure to take the burthen off my own shoulders and perhaps please them by the greater authority than myself, my honored countrymen. This "we," however, brought things to a crisis, as I learned before I retired that night. One of England's honored Sirs told me that had I spoken for myself alone all would have been well, as they well understood what my character and standing was in their country.

This feeling was not universal, for many men came to me after my remarks and thanked me for my gentle touch. While very unpleasant for me at the moment, I did not regret that the blunder was made, for it brought to the surface what was already at fever heat; but the English dentist was too proud to speak of it, unless some good opportunity should offer. I am glad to have been the means of their laying before me, in all its blackness, the doing of the "American dentist" abroad. I shall expose these to you tonight in order that something may be done to make a radical change, so as to blot from the European escutcheon the ignoble title of "American dentist."

To make my position impregnable as a bearer of despatches to you from the dentists of Europe, I wrote to many of the leading practitioners in England, France, and Germany, and they were unanimous in denouncing the average American dentist as found among them. I need quote but from one of the best men in London. He said, "Then, there is another thing. We are accustomed to have everything possible made use of and perverted for their own purposes, by advertising-folks, like the American Dental Institute; and it was thought—I do not know as I said it before of my own knowledge—that your speech contained some plums for them—this Institute—to pick out and use."

This tells in unmistakable language what I had to bear for my countrymen, because of the dishonorable and disreputable men from America. There are others, too, who come from England, as well as from all the European countries, for the sole purpose of returning and placing on their signs the reputable and honored name, "American dentist," many of whom cannot speak one word of English.

The blunder of simply saying "we," while making me the target, also gave me the high privilege of being the exponent of the aggrieved, and I shall feel amply rewarded for the unpleasant position in which it placed me, if the schools of this country grow more careful in the class of students and the restrictions they place upon those intending to practise abroad. I was asked to lay this matter before my society, and have it agitated in order that this condition of affairs may soon terminate. To go on would place a veto on all international congresses, whether associated with the medical or as dental only. Were another congress to be held in London or England, Americans would not have a right to expect the courtesy which was so extensively lavished upon them in 1881.

The noble movement of the dentists of England then, in gaining for us a recognition in the "International Medical Congress" for the

first time, entitles them to the highest consideration and thanks. Everything is being done in their schools to give that social status to the dentist which is enjoyed by even the average medical man. They are more careful than we, by far, about the higher general education and men who have already better social standing. But they feel that their work is largely in vain when we are turning out such vast numbers to flood the market and sail under the banner of "American dentist."

While the average Englishman is a free-trader, yet, when it comes to the professions, he at once sees that it is unfair and unprofitable. Free thought they advocate, but not the freedom to force ignorance and ordinary ability upon them under the name of "American dentist." That they honor individual Americans for much of the advancement and progress of the last quarter of a century, and adopt the methods and practice of any of us who have proven it to be best, I have the honor to know, and the name of such is never withheld.

Until this assumption of one country over another as to being first can be settled to the honor of all, we need not expect that such parading will add to the character of dentists before the world. While America has justly the right to the title and honor of leading in the race of practical dentistry, we need not feel that it is because we have any better material to make dentists of. I found as bright men wherever I went as we have at home. But, gentlemen, circumstances very much alter the results. We have had the widest field for development in the immense destruction of teeth from our habits, with more general distribution of wealth to pay for operations, while in Europe it is the reverse. How few dentists are to be found in Germany, France, or England compared with the number in America! Besides, as dentists become better educated and are brought from the ranks of such as can be made gentlemen, and who value the tone and air that hang around the true professional man, we shall find fewer turned out than now.

At present there are more dentists than have a right to legitimate business, unless they will turn their attention to the poorer classes who are in such need of the competent operator. I can see that competition must come to the rescue or the poor will go without their teeth being preserved. Artificial teeth will be the universal degradation of the poor, and no effort will be made to rescue the living organs. I had many examples of high-toned American dentists pointed out to me who had given no cause for offence, and

who had at the same time made large practices without having advertised or spoken against the native talent.

I do not wonder that the American dentist should have such bad repute, and the feeling against the American physician is just as high. Germany and Switzerland particularly are growing more intolerant every year. When you consider how impoverished the average medical man or dentist is in any of the European countries, you can well understand that self-preservation must step to the front. If we could make the operations cheaper and better, and could reach thereby the poorest, who need our services as well, we might have the American push on.

One strong point I must make against my countryman is that, when he goes abroad as an American dentist, he does not hold up the standard of dentistry as taught here, but at once falls into the same rut as the native dentist. Many of those I met abroad confessed to me that they would starve if they did not give up and cater to the desires of those who had been educated to a certain standard! Few plates of partial sets are made without clasps, and the old gold spiral springs, which are seldom used in this country, are still in universal favor wherever I visited. To attempt to make them without would be suicidal to even the American. Instead of extracting every root, as we do here, all are retained and the plate placed in over them.

I did find one exception, in my student at Leipsic,—a graduate of the University of Pennsylvania, whom I taught my plan of articulation. He has braved it because he has a remedy by which he can do without the spring. When this is generally understood and practised the rule will change. If our men would follow the line of practice taught them, they could more honorably place on their cards, not "American dentist," but "Graduate of an American school."

Again, they take advantage of their own inability to perform good and lasting fillings, and resort to crowning in every instance, where we know that amalgam, and even gold, and for less money, could have been used. The reckless destruction of splendid teeth by crown- and bridge-work is something too awful to contemplate. I have seen, not only in Europe but at home, teeth crowned that could have been preserved for ten or fifteen years with amalgam, and often with gold. I heard one of our American boys, on the other side, boasting of the character of his practice, which had almost been revolutionized since crowning came into vogue, and he was doubling his income.

Now, while the average American has acted so unprofessionally abroad, I can see that his mission has aroused the native dentist to attempt more than he ever did before. His energy has been doubled, and it has urged him on to study and to fly for graduation to some school at home or abroad; and thus the American has been a blessing in disguise.

On the whole we cannot blame the American so much, for he has only gone, just as the Englishman, where the English language is spoken. This thing will correct itself in time. The schools in England, France, and Germany are doing a good work, and are holding on to many students who once would have sought our shores. In the University at Berlin I found, under Professor Miller, two hundred students. When I gave a clinic with gold and smooth points in my mechanical mallet, they piled up around me as if they were greedy to see and profit thereby. They were full of enthusiasm. The professor of mechanical dentistry gave me especial attention when I demonstrated my articulator and its laws. He sat up all night to arrange a set such as I had exhibited, so determined was he to succeed before I left. This school will be a great thing for the German student, as soon as Professor Miller can have more help from demonstrators. The burden on him now is rather too much. The demands in that country cannot be great, and consequently the number of students must be for a long time rather limited as long as there are so many poor who cannot pay high prices.

In Paris there are two flourishing schools, in which there is rather too much rivalry, but no more than to be found here. The French are ready and willing to add their ability and earnestness to elevate their profession. Their enthusiasm is unbounded in whatever they undertake, and I see no reason why there should not be a central school, where, from their ingenuity and precision in all lines of work, they should make splendid dentists, who will rival any of us.

It would be impossible to give you any idea of the character of the operations done in England and the continent, as their offices are sealed books. I could judge of them only by the description from each individual. The clinics given at the Brighton meeting I could not see on account of being engaged on my own work, but they were not very extensive. The papers read on anæsthetics were fine and worthy the highest commendation, showing thorough investigation and practical experience. The mixing of oxygen and nitrous oxide was certainly of value, and should be always used, as

it no doubt lessens any tendency to injury and obviates that purple hue so frightful to look upon when the gas alone is given.

These papers alone gave character to the whole proceedings and had an elevating influence. The practical part of dentistry did not have much show in extensive papers. Prosthetic dentistry was scarcely touched, and no discussion on the one paper that was read. The microscopical section was very fine, and showed great care and research.

The many abnormal and anomalous cases were not only interesting but instructive. Many plans of pivoting were shown as models, and bridge-work came in for its full share, even in England. There was one method of removable bridge which was well worthy of special mention. It was a bar anchored permanently between two teeth by either caps or amalgam in cavities of decay. This bar was narrow and allowed to be as wide or deep as possible, reaching from the gum to grinding surface, that it should prevent the teeth, which straddled the bar, from moving laterally, but allow of sufficient frictional bearing to keep the block of teeth firmly thereon. Where there was plenty of room, or rather depth or length to the crown, it was very practicable. It reminded me of Dr. Wm. C. Eastlack's plan of doing black work on metal plates.

The exhibits of manufacturers of teeth and instruments and chairs were fully equal to anything I have seen at our American Dental Association meetings. The English tooth is certainly beautiful and well made, and has all the advantages of ours, except, perhaps, it will not stand the test in soldering on account of the greater density. But for vulcanite and crown—all porcelain—we need nothing stronger or more beautiful and natural in the mouth.

The burrs given me by Ash & Sons are all cut by young women, and compare well with anything we have on this side of the water made by men. The "Dental Manufacturing Company" is not behind in anything, and proves that dentists can manage such an establishment both with profit and success, as well as manage a dental journal in the interest of dentists.

The colleges I had no chance to visit, as they were practically closed in London. While so much has been done to raise the standard, the end in view—to give to dentistry the same status as the physician—is not an accomplished fact.

I sat beside an M.D. who, with many other physicians, was a guest at the banquet, and, in conversation with him, he frankly stated that dentists were not considered on a par with physicians, although associated in the section of an International Medical

Congress. They feel towards the bulk of them their superiority, and only a favored few have the coveted social standing. I know one who was highly respected by the English dentists, yet he told me that the social status of dentistry, whether American or native, is far from gratifying.

We need not soon expect that same social position and recognition held by medical men, who have labored for years to reach it. Then, a higher educational step, such as the colleges in this country have just taken in the three years' course, will, if they have an honest preliminary examination, rapidly elevate the dentist. In England they are surely working to this end. I can see the barometric marks of elevation since I commenced in 1854. While you may turn out of your schools all that may come, instruct them, should they go abroad, not to assume the name of "American dentist," thereby implying a superiority to all other nationalities.

As I said, science is broader than nationality, and we should be a universal brotherhood, that, by our conduct to each other, we can let the world see that we are above the competition of the tradesman. This is all they ask of us abroad. So high has the feeling run against us, that the American Dental Society of Europe is frowned upon by the natives all over the continent, and it has but few to attend its gatherings.

The patent craze, in England, is not without defenders, especially when it comes to certain articles that require time, capital, and labor to perfect and put on the market, and where they are adapted to other uses than dental. Notwithstanding the number of inventions I have patented, I was not cut at, as at home, at any place or by any one. One prominent dentist of Paris, who had always opposed me, when in America, on patents, after he had read my argument in the INTERNATIONAL DENTAL JOURNAL for July, 1889, and after a talk with him and some invited scientific gentlemen on the laws of articulation and its application against evolution, asked me, "Bonwill, did you patent the articulator?" For several days I gave him no reply. He said, "If you did not, you should have done so, for it well merits a patent."

Then I feel satisfied that, if we shall have more consideration for the dental profession on the other side, and shall teach students not to use "American dentist" on their sign or specially refer to it, but simply to state the college or colleges where they have graduated, we shall bring about a change in the condition of affairs.

I would, in the mean time, advise my English friends to dash ahead and show that they can be equal to any emergency. Let

them rise above such surroundings, and take the advice which I so generously gave them at the banquet, and which I gave wherever I went on the continent, to cultivate the art of filling with gold, as I showed them at my clinics. This would not only enable them to place in more gold fillings, but, from the less time consumed by these methods, they could make equally as much money as when plastics are used. Besides, patients would bear the operation with pleasure, since gold certainly looks superior to amalgam in many places; and, as to pain, it could not be an objection, and the time consumed would not be much greater than that for some amalgam fillings or the placing on of a crown.

If they could universally change their system of fees, I think, they would command more profit and be to the advantage, in every way, of operator and patient. But whatever changes they may make, there cannot be so many teeth preserved satisfactorily unless more time is taken to wedge them apart and contour every approximal filling. If they only use amalgams and other plastics, it must be done only by getting greater space between the teeth to prevent future decay, and make it tolerable in mastication. Contouring in England and on the continent is done but seldom; nor can it be done to be of value unless, as I have said, time is taken to wedge teeth apart to prevent future caries.

Then what I said at the banquet, at Brighton, I do not regret, for it brought to the surface the drift, and I have no doubt of the result of the airing. When we look at home, we find the same spirit existing among our own countrymen. Jealousy, envy, and competition, from members alone, is rampant, and so it may ever be. We have, perhaps, as great a number of poor dentists, in proportion, as elsewhere. Higher education and better material will weed out the weaker, and by the strenuous execution of the laws we can expect that dentistry will rise or go down, as, by the laws of political economy, they must.

We should not lose sight of the ever-present fact that the poor are not to be forgotten. We cannot all be high chargers. We must let every man set a valuation on his own operations, and he who does the best need not fear. The increasing numbers will or should make it better for the world at large.

The American Dental Society of Europe I attended in Paris. They had a two days' session only. But few were present, and they mostly Americans. As I before intimated, it is not recognized by the natives of England or on the continent. It is evidently kept up as a social affair. I do not think the natives should feel

too strongly towards them, for it is not done to keep out any one, no matter what his nationality. It is only a few of the natives who can travel the long distances and go to the expense, unless there could be a universal language. The many literary journals now sent to every hamlet fill largely the place of the dental society in countries where men cannot afford to travel. The illustrations and full proceedings of the principal societies in the large cities are so complete that men need not often leave their offices to know what is being done every month. Now and then clinics can be held that reinforce the mere description of difficult operations. To me it was very gratifying to meet dentists whom I had known through their writings and labors. Go where we will, each nation has its colony; socially, nothing is thought of it; professionally, they should be tolerated, if no insult is intended to the nation on whose ground they meet. It might be less objectionable to call themselves the Americo-European Dental Society. I saw as good operations in gold, amalgam, tin, tin and gold, oxyphosphate, and gutta-percha, in one mouth, in contour as well as flat surfaces, done by a German dentist as well as I could ask at the hands of any American dentist.

They did not do justice to the meeting, for there was such a rush to "do" the exposition and hurry back to their offices. The principal feature was the lantern exhibition of Professor Miller of his special work in bacteriology, which was very fine; but this can be really better studied when transferred to a journal and experiments are made in one's laboratories. The subject of gold and tin for filling was fully discussed, as it has been before, without new light from those who advocate it.

I was asked for my views as to the conservatism of filling-materials, and I had occasion for the first time to combat the views of Drs. Miller and Jenkins, who are the bulwarks of the gold and tin combination. This elicited from them the true reason why they use it so largely. 1st. Gold alone, in caries of any extent, is not only too expensive for the bulk of their patients, but they cannot afford to take the time necessary to pack in so much gold with the old methods and appliances they still use, and the patients will not put up with lengthy operations. Tin alone, while it will save, they admit, as well as the combination of gold and tin, yet, it will not stand mastication so well as the latter. 2d. In teaching at the Berlin University, the combination is almost exclusively taught over gold, for the reason that it can be more easily grasped by the average student than learning to manipulate gold by the old plan that has proven a failure.

Professor Miller and Dr. Jenkins were fair enough to say that they did not doubt my ability, with the instruments I used in clinic, especially the mechanical mallet, to do all I claimed in the use of gold; that it would perfectly preserve tooth-structure in just such cases as I advocated, as well as the combination, and more,—that perfect contour could be restored, and would resist mastication, which would be impossible with the combination. But, inasmuch as most of their operations are made flat faces with permanent separations and allowed to approach each other at the cervix, when caries does occur again it can more easily be repaired or renewed than if gold is used.

They further admitted that, with such an instrument as the mechanical mallet, with the points I am now using, it is possible to put in a large contour gold filling as quickly as when done with gold and tin. So that there is really nothing in the combination that cannot be done with gold alone, provided the operator has the ability to manipulate gold as easily and has our advantages of appliances. Then I could well understand that it was justifiable to use the combination if the patient had not the money, nor the time, nor the pride to submit, when there was a probability that gold would not last. When I placed in a large compound filling of gold at the University of Berlin, Professor Miller admitted it would take him as long to have done it with the gold and tin.

There was but one clinic given besides the one I gave in amalgam; because of an injury to my right index finger I could not make a gold filling. I found that my method of impacting amalgam with bibulous paper under heavy pressure was quite universally practised; but, strange to say, the true spirit of the procedure was not grasped. They mixed their amalgam too thin, and did not use as much pressure as would perfectly drive out the mercury. I found the same trouble in England, which arose from a misconstruction of the description given by Mr. Charles Tomes. My clinic soon convinced them that the amalgam, while it should not be squeezed dry, should be as stiff as could possibly be worked in the palm of the hand with the fingers.

To be satisfactory the meetings of the American Dental Society of Europe should never be less than three days. The social side was fully met by a splendid private entertainment given by Dr. Crane, and the banquet, which was on the Eiffel Tower, was unique and in every way a success.

I regretted to see so few of the French dentists and of the American dentists of Paris in the meetings. I think, if they would use

their efforts to form local societies throughout Europe, it would have a happier and more useful effect in drawing together men who would be glad, no doubt, to gain knowledge from any source. There is not enough new material every year that is worthy of exposure, and they should have a triennial meeting when the International Medical Congress meets in Europe. This would be quite often enough, unless it be for social and mutual admiration.

I was invited to clinic and lecture in Leipsic, Germany, but my stay was too limited. This school is very well fitted up, and commands quite a class, which is largely German. The students are not taught the use of gold for filling as we understand it, for they have not the appliances. They were very desirous of seeing me operate in gold and amalgam. In fact, wherever I went they were anxious to see how we do things in this country, and they had some curiosity to see how fast I could operate, and the reason why it could be done so much quicker than by their processes. I said they are not taught at the university any but the slower methods. While this is a fact, yet it need not be so, for my student, Dr. Paul Schwartz, of Leipsic, a graduate of the University of Pennsylvania, who is demonstrator in their Mechanical Department, is well capable of teaching them every minutia as he was taught here. He has necessarily met with opposition at his own home, as our system is so radically different; yet he persists in carrying out to the letter what he knows from the chances he had in witnessing so many of my private operations. In a short time, notwithstanding the chances are largely against our methods, with such men in their midst, great changes may be expected.

It is not that the European dentists do not wish to learn and adopt the very best system; but with them reform must come slowly, since they have not the means at their command in the shape of wealthy patients. Since it is an accepted fact that gold can be packed so quickly as to overcome the serious objection to its use of consuming much time without adequate pay, and that crown- and bridge-work can be made so profitable, as perfected in this country, they must adopt it very soon or fall far to the rear.

It remains for me now to speak of the First International Dental Congress, held in Paris, September 1, 1889. As the first experiment of an International Dental Congress it was a *grand success;* and considering the opposition given it both at home and in America, and England particularly, it was marvellous that it should have had so many delegates and attendants. It was not surprising that

it should have met such stanch opposition. It was a serious question whether such a step would not be sufficient ground to make the International Medical Congress, as well as the American Medical Association, refuse further to recognize us by a section in their meetings.

I am proud to have been one of its members, assembled to test whether we had the ability to stand alone. Its representation was equal to that of any congress held in Paris, and by men from every country in Europe; and even from America, where so much was done to make it a failure. As to enthusiasm, we had it from the moment the congress opened. The meetings were replete with interest and the rooms always full, notwithstanding the attractions of the Exposition and of the gayest capital of Europe.

The clinics were crowded to suffocation. Once I had to give up; the numbers were so great I was almost suffocated, so anxious were they to see everything done which was calculated to demonstrate the greatest advances of our art. Never before, on any occasion, did I see so many wild with delight at the sight of so much to carry to their homes. While the element was largely French, there was not such complete organization as could have been wished; yet, like everything done in Paris, on this their greatest *fête*, it was worthy of having been born on French soil.

It was just there where the congress should have had its birth. There, in conjunction with so much of the Old World, which needs to have had this at its own doors, we, who are ahead in the race as dentists, should have been glad of the opportunity of lending a helping hand by our presence and action. If dentistry needs the cultivation of art, with the science which has been achieved, it would be more apt to receive it from France; for surely she stands at the head of the world in all that is grand and beautiful in art and sculpture, and to aid such a people in our peculiar practical way would not have been lost to us. Besides, we need not feel that we are the only ones who have done anything for dentistry. When the French once get a start under their new Republican principles, we shall see an advance in every line that will startle us. Hence, I say, "Vive le First International Dental Congress," for the good work it did in arousing the dentists of Europe.

As to whether there should be a second congress is a matter to be discussed. Now that the physicians have given us a section, it is well we should hold to this, at least until we become so unwieldy a body that we shall have to stand alone. The advantages of our

present association with medicine is surely something. To have been recognized as worthy of the attachment to the main body establishes the fact that we have done it for ourselves, and not that we are so much the gainers as they. The French will not have their pride touched should there not be another similar meeting anywhere else. They did a good thing, and they will feel and see its influence in the future, and there was not a man at their meetings who regrets he participated.

As to the social side of the congress, it was equal to anything to which I was ever invited. Their banquet as well as their private entertainments had an enthusiasm and spirit that would be well for us to imitate. They surely believe in enjoying life to the full.

The cases at the Exposition of cleft palate and various restorations of the face were the largest collection and finest I ever saw. In this work they excel. For some reason they have more of such operations than we have, and they lead us here. I saw one case in the private practice of Dr. Michaels where all of the superior maxilla to near the orbit of the eye, and as far up and back as possible to reach without involving the main arteries and the whole of the inferior jaw, had been completely removed by one of the celebrated French surgeons. It was a frightful case. I have here photographs of the woman before and after the restoration by Dr. Michaels, of Paris, who was successful in placing in not only a nose and upper lip, but a set of teeth for both jaws, so far as appearances go, but not for actual use, as it was impossible for him to take an impression. He had to fit the whole thing in by individual pieces. The appearance was all that could be asked, but it necessitated a great deal of trouble to remove the apparatus and cleanse it.[1]

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[1] In further justice to Dr. Michaels, I must mention his new style of gold or silver plates for artificial teeth, which was rather unique.

Clasped plates, as small as possible, are the rule on the continent; and, to enable the operator hastily to form a plate without getting up dies, he conceived the plan of having twenty-two-carat gold rolled into sections or blocks of one-sixteenth of an inch square, so that the blocks were held together by not being cut entirely through, leaving the plate very thin between each section. With a cloth, or the finger alone, this could be pressed on to the surface of the plaster cast and take its form quite perfectly. The clasps and teeth are now adjusted on to the cast, and the plate held down on the plaster cast with wire. Twenty-carat solder is run on the surface of the plate, which fills up between the blocks, and makes a solid plain surface and quite stiff. The plaster cast

One very novel instrument that I saw was a pair of forceps, at one of the schools, invented by one of the professors. It was on the same principle as a monkey-wrench, with the regular jaws of forceps, which enabled the operator to hold the jaws or beaks in close contact with the tooth to be extracted, and there was no possibility of crushing the tooth, nor slipping off, from grasping too tightly.

Compressed air and electricity are playing quite a part in many of the offices in running all their machinery, and aiding in many ways to secure better results with less expenditure of force. My own clinics were in gold and amalgam filling, and the use of the articulator in making artificial teeth. It was a surprise to all to see perfectly smooth oval pluggers wiping in gold at the rate of one book and a half in forty-three minutes; also how it was possible to make Abby's old-fashioned gold foil adhere as perfectly as any of the most cohesive foil. Compared with the slow packing of gold, this was to them a revolution, and they could well see and express the belief that it was now possible for them to begin to use gold as much as we do, and get results never before attained.

When I spoke before the congress of my articulator and its uses and the importance of the geometrical laws concerned in studying cases of irregularity, Dr. Davenport read the following, which I feel in justice to myself should be repeated:

"The long observation and study I have given the articulation of the teeth, with the hope of determining the laws governing their relations to each other and to the surrounding parts, anatomically, physiologically, and mechanically, enable me to appreciate

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has as much sand mixed with it as is used in making the usual investment for soldering. For cheap and hasty work it is good. The great objection with me would be that, as I never solder the clasps to the plate from the plaster model on account of making an imperfect fit, I fit the plate to mouth first, then the clasps to teeth in the mouth, and while the plate is held in position I place plaster over the clasps and plate, and allow it to harden, and when removed from the mouth run into this plaster and sand and solder. This will always make perfect adjustment, and there will be no wear on the teeth and the clasp can be very loose. To do this with Dr. Michaels's plate, it would have to be soldered over its face first, and then the teeth and clasps afterwards. I saw this same thing at Louisville, Ky., in 1888, but made from fine twenty-two-carat wire gauze or netting, and the meshes afterwards filled in with solder. I think this would make a better adjustment. This is only intended for partial sets; it will not do for suction.

with the keenest delight what Dr. Bonwill has so beautifully explained to us. He has expressed a most intense practicality in the very highest scientific terms.

"Those observers who object to ideal standards of comparison, and insist upon average conditions as the only safe basis, ought to close their mouths until the pure science first taught by Dr. Bonwill penetrates their ears, and their eyes have seen its practical results.

"As a profession we ought to confess to Dr. Bonwill our regret that the meaning of his words uttered thirty years ago are only now being comprehended by us. To-day, the profession, in reopening an old mine, has uncovered a priceless gem which once was thrown aside as worthless."

I had previously explained, on several occasions, to him and several scientific gentlemen whom he had invited to meet me, until he had become very thoroughly imbued with its importance, as the lines just read plainly indicate.

I do not know whether you will consider it any honor to you for your delegate to have had any special favors shown him at the congress; but it was done, and no one else received a like ovation; and as it comes to you in the report of their own journals, you cannot doubt it. They could not have shown more consideration for any hero, and it was done unstintedly and on all occasions.

I trust there will be no misunderstanding of what I have said by any of my good friends on the "other side," for I have sedulously endeavored to impress my countrymen with the facts as I have received them. Something should be done to harmonize the status of dentistry in all parts of the world, so that each man can feel that there are no lines of nationality; that the sole aim is the greatest good to the greatest number. We must always expect more or less of contention, for the medical profession, after three thousand years, has the same to face everywhere. The native practitioner is always jealous and envious of the foreigner wherever he may be. We have it here, rampant, in every hamlet. The best way to eradicate it is to make ourselves competent, and so far above the competition as not to fear his inroads. This must lead the weaker one a step higher also.

As we appear to have so much in our hands that is calculated to advance the interests of dentistry, and make us all more akin throughout the world, I would advise that we do all we can to make of us a profession that knows no nationality, that every man,

in whatever nation he may be born, educated, or may practise, should feel the assurance of being well received here, and that, when any of us go abroad to practise, we shall do nothing under the title of "American dentist."

DISCUSSION OF DR. BONWILL'S PAPER.

Dr. Guilford.—I am not prepared to open the discussion of this paper; not but that I have something to say on it, but I would rather some one else spoke first. The paper was a good one, as it describes the impressions of American dentists in Europe on Dr. Bonwill. The fact that these dentists practise in an irregular way and receive, no doubt justly, the condemnation of their European brethren is no reason that Dr. Bonwill or American dentists at home should suffer for their doings. And it irritates me that Dr. Bonwill, who has done so much for the dental profession and to whom the English, as well as we, owe so much, should be so slightingly treated.

When a member of the dental profession from England comes to this country, we take him into our offices, show him our instruments, and how we operate; and if we have anything especially new we try to give him all the points we can on it. Not so when we visit them, as Dr. Bonwill has said in his paper; when we go there we are slighted and never see an operation of theirs. Even in our treatment of each other we differ, as the profession seeks here to give to the world at large any new ideas we may have, and we keep nothing back; while in England they are so jealous of one another that a dentist is unwilling another should see him operate.

Then again, the standing of the profession is different here from what it is in Europe. We have risen here from mere mechanical laborers to the dignity of a profession, and are privileged to term ourselves doctors. In England a dentist can only style himself mister. Even a medical man may not call himself doctor. It is plain "Mr." A surgeon may be called doctor, but not so other members of the profession. In Germany they are given the title of doctor only for some worth they may have or seem to possess. Dentists in England occupy a much lower position than in America, for the reason they have not advanced so rapidly. In England they are ranked as mere mechanics. Some of our most indispensable instruments and most highly-prized discoveries are not at all used there.

Certain American dentists have practised there in an irregular way, making capital out of their title, and advertise themselves as "American Dentists," and try in a very unprofessional way to secure practice. Of course our English brethren are very jealous of these practitioners, and the whole American nation are ostracised for what the few do. When Dr. Harland, of Chicago, travelled over there to read them his paper, I saw where "Mr. Harland read a paper which was discussed," with not a word of the paper or discussion.

Dr. L. Ashley Faught.—Though not so well prepared as others, yet I think there are some things yet to be considered in the treatment of Dr. Bonwill's paper. I have not enjoyed the high privilege which the speaker who preceded me, or Dr. Truman, has,—that of a trip to Europe. So I may not be so well qualified to speak as they, yet I have observed the people who have come to this country. They do not think we are up to their social status. They do not cultivate the spirit of professional unity to the extent we do here in this country. They do not seem to understand our relations. A party of legal gentlemen who were being entertained here were invited to dine with Mr. George W. Childs. They hesitated whether they should go, and, taking one of the men whom they knew to one side, questioned, "Who is this Childs? Do you think we would better go on?" It is this spirit that prevents their recognizing us and giving us the credit that is due us.

Dr. Bonwill.—Neither of the gentlemen who have spoken seem to know anything of the matter in discussion; they do not understand the position at all. I myself was treated with every consideration. I could not have received better treatment had I been a king. I was dined, given entertainments, and invited everywhere by the people. I was given every opportunity for clinics, and they were well attended,—giving me all I could do. As I said before, I was well treated as an individual, but it was my association with Americans that made me feel an undercurrent of something which I at first did not understand, but my guest, Sir Hugh Tomes (?), afterwards explained to me. When I wished to step inside and see what the Association of American Dentists were doing, I was told by all means not to do so. They will make capital of it and to-morrow will publish that the distinguished American, Dr. Bonwill, visited us, etc., and then my friendship will avail you nothing. Even my guest would sacrifice his friendship for me (which was very strong) rather than seem to favor American dentists. When called upon to address them,—which

call was forced upon them by my friends,—it was tacitly understood that dentistry was not to be mentioned. But I introduced it and praised it all I could, and of course, being a true patriot, spoke of what we had done. I was highly applauded until I used *we*, then there was a painful coldness which no one tried to disperse. The whole fault lies with the dentists who go there and advertise themselves as American dentists and use other means which we would consider unprofessional. You cannot blame the English for what they do. These dentists are usually an ignorant set, and do not even take a dental journal to keep themselves posted. If they would only stick to American dentistry they would do much better. But they do not know how to use our more recent instruments even when they have them. I was in one of their offices in Liverpool. It was a long time before I could make him understand who I was; at last he remembered having heard me teach at the University of Pennsylvania [President: The doctor should not be personal]. I noticed he had an electric mallet. I asked him if it worked perfectly, he said yes, everything was in order; I then asked if I might see it, having some misgivings as to his understanding it. I found he did not have the armature or hammer on the tool at all. It only touched the hard rubber of the armature.

"Give me," I said, "a blunt-pointed instrument." I placed the armature on the table and adjusted it, gave a screw a few turns, and completed the circuit. I then handed it to him and asked him if he saw any difference in its action. "Yes, that strikes a blow," said he. I gave the screw another turn: "That strikes harder." "Now," said I, "you have been using this all the time without getting any benefit from it other than you would get from a hand-plugger, by not knowing how to use it." "I see it," said he. You can imagine my disgust to see my pet in the hands of one who did not know how to use it.

Another lady dentist [Dr. Faught: Surely not the University this time], in whose office I was, did not know the proper use of half the instruments, and had never heard of my electric mallet. I asked to see a journal, that I might show her a description of it, and she said she did not take any.

Dr. Teas.—I was very much pleased to hear the paper, as it gave me many points. Again, I was glad to hear Dr. Guilford say he did not like the treatment Dr. Bonwill had received and speak so highly of his accomplishments. Dr. Guilford had said we have progressed. Indeed we have, for I can easily remember the time

when Dr. Bonwill would not have been allowed to read a paper before this society; even when he was asked to retire.

Dr. Guilford.—I don't know that Dr. Bonwill is deserving of our sympathy. He surely deserved any ill-treatment he received. To go to a meeting when he knew he was not wanted and when called on to speak to respond, when he knew if he had been wanted he would have been put down, and then in the face of all this to have the audacity to speak on dentistry when that was a subject not to be mentioned! I think they did not treat him mean enough. I thank the doctor for having put me right on this thing, but still I think there is much in what I first said. We have here patients, most of whom are ladies; if we treat them in our office we meet them socially, and should we pass each other on the street we are recognized and the acquaintance is kept up. Not so in England. An English lady would think no more of speaking to her dentist than her coachman.

Dr. Truman.—Unfortunately, I could not be present at the reading of the paper, having been called to New York, but I have no doubt it was very good. You speak much of being recognized, and of foreigners recognizing us in the profession. We will be recognized by others just as soon as we make ourselves worthy. Let us not bother ourselves with our rank, but let us devote our energies to improving ourselves and the medical profession, and all others will be compelled to recognize us. As to American dentists practising in other countries, they go to a foreign land and do what we would frown on a dentist from the country for doing in our own city. That is an old and thickly-populated country, and living is reduced to the straitest means. With all this we go there and literally take the bread from their children's mouths, and expect them to recognize us and associate themselves with us. In my early life I was one of the sinners. But the consideration of these facts, with some other reasons, made me leave there, for I would not be guilty of anything so mean. The standard in Germany for education is much higher than it is here. Every one is compelled to be a graduate of one of their great classical schools before he can be entered as a student of dentistry. Then after he graduates he is worthy of notice. I do not believe any of us would like to receive foreigners better than they.

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THE regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, January 4, 1890, at the hall, Thirteenth and Arch Streets. President Truman in the chair. A paper was read on "The Dental Crown,"[1] by W. H. Gates, D.D.S., Philadelphia, and one on "A New Reamer for Pulp-Canals," by C. H. Littleton, D.D.S., Philadelphia.

THE DENTAL CROWN AND ITS ENABLING METHOD OF REMOVABLE BRIDGE-WORK.

BY WILLIAM H. GATES, D.D.S., PHILADELPHIA.

Advance in the art of dentistry, while so pronounced and gratifying in most respects, has been singularly slow in producing a satisfactory substitute for the natural crown.

When carefully examined, in fact, it will seem not a little remarkable that the radical errors and absurdities of that old-time method known as "pivoting" are the actual basis of the prevailing method of to-day. These absurdities arose from the anatomical mistake of supposing that a through and through cut, from the labial to the lingual curve of the gum, was the proper line of division between the crown and the root. This mistake was manifestly excusable coming at a period of dental science when such crude devices were its exponents in art; but we must no longer overlook this anatomical relation, as the natural outline of the end of the root is suggestive of the best possible form for the crown.

The distinctive features of pivoting were the concave foundation in the end of the root and the tooth rudely joined therein by the dowel, or "pivot," as it came to be called from its tendency to turn; but these are likewise the basal features of the so-called porcelain crowns. In both—the Gates-Bonwill and the Logan—the change relates only to the *make-up* of the so-called crown and its pivot, the outer part being of porcelain, while the basal portion of both alike is of plastic material added thereto because of its adaptability to the pivot joint in the end of the root. To have termed either of them a *crown* was incorrect, as no crown has a convex base. They are simply composite pivot-teeth, and the post of each is the core of its pivot.

An objection to the existing pivoting method is, that it cuts away the natural base susceptible of being clasped like a rock and

[1] The discussion of this paper was deferred until Dr. Littleton's paper had been read, and both papers were then discussed together.

interposes in its place a base that throws the entire support upon the post-pivot, and thereby forms an adverse leverage within the end of the root, the extreme length of the composite pivot-tooth being the long arm, and the radius of the end of the root the short arm of the lever. This tendency to split the root becomes still greater through the vertical diameter, as the tooth, confined by the post between the lateral inclined planes, acts as a positive wedge. In view of these facts, which are witnessed also by the immense strength required in the platinum posts, we must certainly have increased respect for the stanch qualities of root material that has so rarely given way under such adverse conditions.

A further objection to this pivoting method arises from the impossibility of making a proper joint where there is no guide but guesswork; no opportunity to see or know the relation of the two surfaces when applied; no guide for the proper occlusion with the opposite jaw; no recourse, indeed, but to cut and try for some sort of makeshift.

Because of these difficulties the suggestion of the amalgam base was thought to be a great boon, and the porcelain was countersunk to receive it. There was a grievous disappointment, however, because of the mechanical impossibility of getting the amalgam to a proper position in so large a single quantity, which soon became apparent. Resort was then had to the perishable plastics, because less rigid before setting, a gold band being employed to protect them, and likewise act as a *bandage* for the ever-threatened root.

But why must we infringe on the pericementum, establish bacteria nests, and disfigure the tooth with this bandage of gold?

If we take nature's suggestion we will replace the natural crown with a substitute that presents a true mechanical joint, into which the end of the root projects, and which is therefore properly called a crown. Such a crown I have provided, and hence have termed it *the dental crown.*

Referring to the drawings for its illustration (see plate), the line *a a*, Fig. 1, shows the anatomical outline and the strong defensive angle of the end of the root, while the dotted line *b b* indicates the slight modification necessary to make this angle available as a perfect crown-seat, a ledge, *c*, Figs. 1 and 2, being formed at the outer base against which the crown may solidly abut. This ledge neutralizes the inclined plane which would imperil the crown, and as the crown seat represents a trifle less than a right angle, the plane *d* supplements in the most ample and positive manner the support afforded by the ledge, with the result that we have here a mechani-

cal crown-seat of the very highest order, affording permanent protection both to the root and to the crown.

To make this crown-seat, a facing-wheel, Fig. 3, and a gauge, Figs. 4 and 5, are provided, which are very exact and practical in application, because each has a supplemental form that allows one plane to be finished before the other is begun. The facing-wheel is file-cut on its front face. Its diameter covers one face of the crown-seat, which it quickly and definitely forms while firmly sustained by a self-centring point, *e*, Fig. 3, which, separately made, has been hermetically sealed into its mandrel; and as this centring point cuts only on its front face, *f*, Fig. 3, which is also its largest diameter, the wheel is thereby confined to the selected position while free to adjust the plane of the crown-seat to any inclination desired.

The gauge, made of sheet metal, represents a kind of skeleton of the body and the outer lobe only of the crown, the body of the lobe being represented by a circular crib, *g*, Figs. 4 and 5, over which its outer face, *h*, rests as a hinged cover. The natural crown having been reduced to the line of the gum, and the enamel removed, this gauge is simply applied against the end and labial face of the root while forming the outer face of the crown-seat by the facing-wheel. The occlusion with the opposite jaw, the mouth being closed, determines at once the length of the crown required; and by uncovering the crib in testing, to be sure of its proper contact, this outer and determining face of the crown-seat is carefully formed, the contour of the gauge proving the position correct. Thus we have an unfailing guide, a direct open view, and a thoroughly-controlled, painless, and effective instrument for overcoming, right at the start, the paramount and, by the old method, most formidable difficulties of crown-setting,—viz., obtaining the correct position and the proper adaptation.

The supplemental or face-extension wheel, Fig. 6, is of similar diameter to the facing-wheel, but cuts only on its peripheral face. Resting flat on the plane already formed, it simply extends that face of the crown-seat as far up under the free edge of the gum as the selected crown requires. Of this form there may be a pair, cutting right and left.

The supplemental gauge, Fig. 7, is an oval band or crib bent edgewise to the standard angle. Guided by the outer face, this quickly determines the correct position of the inner face of the crown-seat, which is formed by a facing-wheel in the right angle attachment.

It will be observed that the coronal end of the crown-seat extends beyond the enamel line at the ridge. This, like that at the ledge, is a useful variation from the saddle-shaped, anatomical outline of the root, as it projects a solid line of support of unexampled height into the centre of the crown. It is slightly trimmed at each end to admit its reception between the lateral wings *a'* of the crown so provided.

The crown itself requires no trimming. It represents the standard of joint as suited to the crown-seat. The special advantage, in an economic as well as an artistic sense, in having at hand perfectly-adjusted crowns in porcelain, need not be enlarged upon. It may be mentioned here that in the manufacture of this crown it is contemplated to embed into the porcelain just within the peripheral border of the angle a slight rib, or a perforated mat of platinum, in order always to have exact uniformity of the gauge.

An important feature also embodied in this crown consists in employing a staple as the bond between the crown and the root. Entering the inner face of the crown, its loop is bent backward and embedded in the porcelain towards the outer face as shown at *i*, Fig. 8, thus securing the most powerful combination with the crown-seat. This arrangement provides an open passage directly through the crown and the pulp-canal while the crown is in place upon the root, and affords facilities for the attainment of highly-important purposes.

Instead of having the approach to the canal sealed with impenetrable porcelain, it is a manifest advantage to have an opportunity to reopen in case of pathological conditions not apparent at the time of closing; and the open passage is of still greater importance at the time of setting the crown, for it permits the centre of the crown to remain open and undisturbed until the treatment can be made under favorable circumstances. Thus, instead of wasting time at the start in a difficult diagnosis of the case, the crown-seat is at once formed, the canal enlarged, and the crown set with gutta-percha; the presence of a slender pin embedded there leaves the canal open when withdrawn; and on removing the crown at a subsequent sitting, the treatment is made with every advantage of free access, an open view, and the opportunity to make deliberately whatever tests may be necessary.

This open passage also makes available an important discovery touching the material employed in the setting. Gutta-percha, having shown unusual tenacity and power of resistance as a thin layer between this crown and its crown-seat, requires only the as-

sistance of a firmly-embedded staple to make it serve as a permanent setting. But this direct access is essential in order to embed the staple properly.

The convenience and simplicity of such an adjustment is instantly apparent. A thin layer of gutta-percha, adapted to the base of the crown, is warmed and impressed upon the crown-seat, which, being moist, allows the crown to withdraw the gutta-percha as an impression. The excess at the border and immediately around the staple being trimmed away, it is warmed and replaced until the crown practically rests against the crown-seat. At this point, if the mounting is to be temporary, two slender sticks of gutta-percha are warmed and pressed within and upon the opposite edges of the staple, embedding also a small ordinary pin between them. The point of this pin, made blunt, will be slightly in advance of the gutta-percha when inserted into the canal, and the gutta-percha should be at least an eighth of an inch in advance of the ends of the staple, so that in condensing it may obtain firm contact with the sides and retaining-points of the canal. The canal and root having been well dried, the loosening and withdrawal of the pin will leave the case in a safe and successful condition. But the permanent placing is still more simple, as, when the gutta-purcha setting has been adjusted to the base of the crown and the root dried, nothing remains but to partly fill the canal with a soft mix of amalgam, carry the crown to place after warming, and finish by thoroughly introducing very dry amalgam until mercury will no longer appear.

In making this permanent closing of the canal the insertion and withdrawal of a slender steel pin, reaching almost to the foramen, will leave a closed tube in the amalgam for more convenient approach in case of necessity.

It should here be stated that amalgam itself is perfectly adapted for setting this crown, as a soft mix, placed between the crown and crown-seat, permits the crown to go fully and easily to place, leaving only a mere film of amalgam between, the excess of mercury being withdrawn at the same time with that in the canal; and the only part of the joint facing outward, namely, the ledge, is easily provided with a fender excluding the amalgam, so as to appear, if at all, only as a fine line of gold. But the extraordinary convenience, entire concealment, and stanch character of gutta-percha as a cement between two solid surfaces, otherwise sustained in close apposition, make amalgam unnecessary, and add to the laurels of this invaluable material, gutta-percha.

The reaming of the canal is preferably deferred until the crown-seat is formed, as any improved position desirable to be given to the crown will require ordinarily only a slight corresponding change in the position of the staple at the mouth of the canal without resort to bending; and since the dislodging force against the crown, hitherto born by the post, is here sustained by the crown-seat with its immense reserve of force, we can widen laterally, or make such other shaping of the pulp-canal as suits any purpose of advanced ideas.

But the question will be asked, How shall the position of the crown-seat be determined when the end of the root is far decayed or already cut into concave shape? Simply by inserting into the pulp-canal, temporarily, a pivot of orange wood, the outer end of which, cut to a wedge-shape, will give support to the centring bar of the facing-wheel. In such cases, after the crown, set for a few days upon these partial outlines with a slight excess of gutta-percha, has pressed the morbid gum back to its normal condition, a section of corrugated tubing, having its outer end likewise cut to wedge-shape, is to be permanently set into the enlarged canal by means of amalgam, which is then simply built out far enough to restore the crown-seat. As all tendency to split the root is interrupted by this simple arrangement, it is obvious that roots otherwise impossible of preservation may in this manner be saved. Boxes of these wedge-pointed pivots and sections of corrugated tubing may be kept at hand.

Lastly, the facility of the open canal offers a unique advantage for bridge-work. All banding is set aside and a strong, simple, and removable attachment is made to this crown. A lingual gold face set into the crown its own thickness, *j*, Fig. 8, including a short hood at the cutting end, is easily secured by a suitable screw, *l*, Fig. 8, provided with a platinum counterpart previously embedded in amalgam in the pulp-canal.

In conclusion, it gives me pleasure to say that I have this method of mounting bridge-work protected in the United States Patent Office for the profession, and that they shall not be subject to the payment of office rights for the use thereof.

A NEW REAMER FOR PULP-CANALS.

BY C. H. LITTLETON, D.D.S., PHILADELPHIA.

There is no operation in dentistry which requires more skill and care than the treatment of the roots of devitalized teeth, and yet, judging from the various methods advocated, the dental profession is far from a satisfactory solution of the problem.

It is not the intention of this paper to discuss the different conditions requiring root treatment, but only to present some new facilities for the preparation of the canal and hermetical sealing of the apical foramen.

To insure permanent success, it is necessary, first, to carefully remove the entire contents of the canal without forcing any substance whatever through the foramen; secondly, the canal must be sufficiently enlarged at the apex to enable the operator to make a filling at that point with a strictly impervious, non-absorbing material.

To accomplish this an instrument is necessary that will cut smoothly, clearing itself as it advances, without any piston-like effect. The instruments I use for this purpose are self-centring in the canal without the usual guide-point. The ordinary point on a canal reamer has a tendency to force material in advance instead of withdrawing it, and it also retards the cutting. The only bearing of this reamer is its rounded front, which, by being short, enables it to centre itself in the canal without interfering with the flexibility of the stem. This front is cut into very definite blades for rapid cutting and self-clearing; and the general form of the reamer, being a flattened globe, serves to withdraw the cuttings.

The longest diameter of a pulp-canal reamer should be at right angles to the stem, in order to permit the flexible stem to control it from its front instead of from the rear. Thus it is always free from the cramped position of a long-bodied reamer and the consequent danger of breakage.

The stem should have a fine spring temper, so as to operate easily at any required angle,—its flexibility varying according to the directness of the canal. For the more crooked canals it should have a uniform flexibility extending two inches from the cutting end.

The handle is octagon in shape, which, in connection with the flexible stem and cutting front of the reamer, makes this hand instrument so delicately sensitive to the touch of the operator that he is enabled to feel its advance in the canal, and, by the greater resistance, judge of its approach to the end of the root. I have them made in sizes varying from 1 to 4.

To hold the flexible stem at the necessary curve, and thus relieve the reamer from side-pressure when operating in the roots of posterior teeth, I have a hole made through the centre of a mouth-mirror; the stem passing through from the back can thus be controlled by the handle of the mirror.

For convenience in placing the flexible stem in this position a narrow slot is cut in the mirror from the side opposite the handle. Hooks soldered to the rim of the mirror will also further assist in guiding the instrument.

In reaming, or in any operation in a pulp-canal, it is of the first importance never to produce a pneumatic or piston-like effect. Periodontitis is often produced from this cause alone, as a bubble of air, charged as it is apt to be with septic matter, is highly irritating, and its imprisoned elastic force, if maintained, is more hurtful to the peridental membrane than a puncture by an instrument. It is, therefore, obvious that thorough desiccation of the canal is an essential prerequisite. With perfect dryness and the self-clearing action of this instrument no material whatever will be forced through the foramen.

In operating in a small and crooked canal, as, for instance, in an anterior lower molar, the approach at the mouth of the canal should be straightened with the engine-bur, cutting in that case very freely towards the front walls.

To ream a canal with safety and facility the reamer must be proportioned to the size of the canal. Having followed a very fine canal with reamer No. 1 a short distance,—thus obtaining greater freedom for the flexible stem,—it is easily enlarged with No. 2.

When the end of the root has been reached with this reamer, there is a definite shoulder formed at that point, against which an amalgam filling not larger than a small pin-head can be easily made. The amalgam should have such plasticity that a small portion may be carried on one of these reamers and tamped gently to place. Amalgam is well adapted for this purpose because so little force is needed to make it an hermetical stopping, and, being non-porous, it cannot become charged with septic matter. As cotton, the cements, and especially gutta-percha absorb the matter that remains more or less present in all cases, the necessity of impervious sealing at the apex is clearly indicated. The apical foramen being sealed with amalgam, the remainder of the canal can be filled with cotton covered with gutta-percha, or other material easy of removal, if future operations in the canal be found necessary. Should it ever be necessary to reopen the foramen, the small amalgam filling can be readily cut away with one of these reamers.

In case of an enlarged foramen, from whatever cause, the softened dentine and cementum can be removed with one of these instruments, and a shoulder formed near the end of the root with

the next in size, against which a plug of platinized silver wire covered with amalgam may be adjusted.

The amalgam filling, made at the end of the root, affords great advantage when the root is used for crown- and bridge-work, enabling the deeper anchorage of the pin and preventing any disturbance of the peridental membrane during insertion or removal.

DISCUSSION OF DR. GATES'S AND DR. LITTLETON'S PAPERS.

Dr. J. A. Woodward.—The reaming of root-canals has been as strongly advocated as objected to by many competent operators. The practice of those who do not ream is largely the result of the use of defective instruments. After a struggle to remove the tempered point of a drill from a canal difficult of approach, most of us are careful not to have that experience repeated, and, to avoid it, only ream or enlarge a canal as far as we can perfectly control the instrument used.

The set of reamers presented to us to-night is a decided advance. The slender, flexible shank permits the cutting blades to follow a canal, when the reamer is of proper size in relation to the diameter of the canal, and should give us the means of safely reaming where we would not venture with the older drills. The perforated mirror is an ingenious assistant. As to reaming to the apex of all roots, I have been led by experience not to try it. Generally I ream sufficiently to gain access near to the apex. I have found that the less the canal at the apex is interfered with the better has been my success.

My experience with crown- and bridge-work has been quite limited, but if for an abutment for a bridge or not I think all roots, with few exceptions, should be so treated that the canal-filling should not need to be removed, as removable root-fillings appear to invite the very conditions we wish most to avoid. The use of gutta-percha to make the joint between the new crown of Dr. Gates and the root I can unreservedly endorse, as it has proved with me the best material for that purpose.

Dr. Register.—I do not think it matters much whether you ream or not. In reference to root-fillings we are not able yet to distinguish just which roots should be filled with cotton, which with gutta-percha, and which with amalgam at the apex. If the pulp has been removed, I prefer to fill the tooth with amalgam even to the apex. I am much pleased with the instrument and think it a very good idea.

Dr. Roberts.—If I understand it right, the doctor claims that by

the flexibility of the stem of his instrument he gets a delicacy of touch far greater than with the ordinary instrument, and which enables him to follow any canal and prevents any mistake.

Dr. Littleton.—Dr. Roberts grasps the idea. If there is any canal, that instrument will follow it, and follow it to the apex. The instrument is very delicate to the touch. Then, the great advantage is that it does not push matter ahead of it and carries no septic matter into the canal. If we have to reach the apex of a bad root in a tortuous canal, while this reamer will follow the canal it will not push matter in advance of it.

Dr. Jamison.—When I first began to practise dentistry I used to feel along with a flexible instrument which would cut the canal open; but now I have no use for it. From the instrument exhibited it looks very much to me that it cannot but force matter ahead of it from the twist which it has.

Dr. Littleton.—If the doctor will take my instrument and try it awhile I think he will change his mind and will find it quite different from what he anticipates.

Dr. Faught.—Some six weeks ago I had the pleasure of giving some statistics to a society in New York on "whether to ream or not to ream," and I can assure you it is a moot question, and not at all decided that we should always ream. I would like to know the practice of each, and hope all present will state in their discussion whether they are in the habit of reaming. I let the apex alone after I have cleaned out the root-canal. It may be some advantage to the teeth to fill the apex with cotton, gutta-percha, or what not, but I fail to see it. When I wish to ream a canal I can feel with a flexible instrument as well as I can with a flexible point.

Dr. Tees.—I am pleased with Dr. Littleton's reamer and think it is a good instrument. The fault of Dr. Gates's crown is that the post comes to the labial and not the palatal surface of the tooth. I think an offset of $\frac{1}{32}$ to $\frac{1}{16}$ of an inch on the next tooth will serve very little to hold it in place.

Dr. Gates.—The anatomy of the tooth will determine the direction of the post.

Dr. Tees.—This crown is some advance upon posts for the teeth.

Dr. Bonwill.—It is so seldom that we hear of a new thing with any real merit in it that we are always inclined to doubt the usefulness of it. But I am inclined to think well of Dr. Gates's crown. I have crowned teeth which were used for five years, and no trouble was experienced with them.

Dr. Truman.—In regard to Dr. Gates's crown it is evidently an advantage to have the post or pivot on the concave side of the root. When properly applied with the instrument which Dr. Gates has described it is undoubtedly a great improvement. I regard it as a useful addition to prosthetic dentistry.

INCIDENTS OF PRACTICE.

Dr. Head.—I have been noticing for a year or two past that something has been making fearful ravages in the teeth of my patients. I found that on every occasion of this my patient was an ardent lover of "acid phosphate." I felt there must be some connection between this drug and the trouble with the teeth, so I determined to investigate the matter. To do this I got a supply from a druggist and dropped a tooth into it, and found that in thirty minutes it had formed a thin film on the outside of the tooth and the whole enamel was softened. In two days the enamel was as soft as the other part of the tooth, and the whole tooth could be crumbled away.

Such being the case, I thought it best to report it to this society, that others having patients using this drink might warn them of its deleterious effects.

Dr. Truman.—I have heard the same complaints made against this drug, and feel that we all should warn our patients against its use.

THE regular meeting of the Odontological Society of Pennsylvania was held Saturday evening February 1, 1890, at the hall, Thirteenth and Arch Streets. President Truman in the chair. An address on the "Degeneracy of Tooth-Structure" was delivered by Harrison Allen, M.D., who spoke as follows:

DEGENERACY OF TOOTH-STRUCTURE.

BY HARRISON ALLEN, M.D.

I desire, in the first place, to speak of the manner in which the word degeneration will be used in connection with tooth-form. I will attempt to show that degeneration is a form of specialization. Degeneration, therefore, can never be seen in a tooth which is not highly specialized. A degenerated tooth is more apt to appear towards the end of the series to which it belongs than at the beginning. Conceding that the molars of the upper jaw form a true series, degenerations are more frequently seen in the second and third than in the first tooth. The same remark can be applied to all organic structures which are arranged in series. Professor Alpheus Hyatt (On the Genesis of the Arietidæ) has called attention to the degenerations which occur in the last-formed chambers of Ammonites; these are not different in kind from those in the molar series. An apparent explanation for degenerative changes lies in the fact that the structures which are formed last are at the same time part of a natural succession, and, having a common origin, tend to weaken as they appear at the end.

A degenerated tooth is distinguished from others by the thickening of the lateral contour-lines. If a tooth (like the bicuspid) is composed of two cusps arranged from the buccal to the palatal surface, the lateral contour-lines are those which connect the anterior and posterior borders of the cusps with each other. A tooth in advanced degeneration may exhibit the lateral contour-lines in such proportions as to equal in height the true cusps, and the tooth may thus appear to be composed of a single cusp which is excavated and truncated. Such a form of tooth may receive the name of crater-like tooth. It is often met with in the human third molar.

A general form of degeneration is seen in the molar teeth, especially in those which vary by the reduction of the normal number of cusps. It is a mistake to assume that when cusps are lost (as, for example, a "four" cuspidate form becoming a "three" cuspidate) the tooth is always an example of the principle of reversion. The

cusps may be lost by degenerative process, and no reversion be suggested.

It is evident that, in order to have a reversion, one must demonstrate the form of which the reversion occurs. If I were to take as examples the human teeth and name the variations in their forms on the principle of reversion, I would suggest a motley group of structures,—strange company, indeed, for man and his kinship to keep! For instance, I would bring together ape-like structures, as those seen in Cebus, Alouatta, Lemur, and Cercopithecus; hedgehog-like structures, as in Erinaceus and Centetes; bat-like and mole-like, as in Atalapha and Talpa; to say nothing of forms suggestive of those of sirenians and rodents, as well as those of ancestry as remote as those of Phenacodus, Peritychus, and Coryphodon, which Professor Cope has told us so much about. Such an insistence is absurd. No; many of the variations in the human jaws are not reversions, but degenerations; that is, they are failures on the part of a majority of instances of a given type-form to keep up to the standard. It may be asked, "Are not your degenerations mere monstrosities?" I reply that they are not, since they are consistent within themselves,—are confined to lines within those suggested and maintained elsewhere in the dental series,—they are never eccentric, and always suggest the normal relation of parts as these are seen in the lower animals.

There is a degenerate form of human tooth-structure which is exhibited in the first and second of the series of the upper jaw, which I have ventured to call the *ellipsoid form*, and describe it as follows:

The ellipsoid tooth is a conversion of the quadrate to the ellipsoid shape of crown. It is an instance worth mentioning that all the ellipsoidal teeth which I have had extracted from the jaw were found, on examination, to be coalescent at the roots. Out of fifteen examples which I have recently examined, six were complete in coalescence; in a word, all three roots were merged into one. In seven, the two buccal or ectal cusps had coalesced; in the remaining two, while all three were distinct, the ectal or palatal cusps were closely proximate in their entire length instead of being divergent as is the rule. It is evident that in this form of tooth less resistance is afforded for the tooth to retain its position in the jaw than would be the case if the roots were widely divergent.

In the living subject I have frequently observed the ellipsoid form of molar tooth, and I have never in a single instance found it in a jaw in which the teeth were of the best type. Very commonly

it is the second molar (although it may be the first) which exhibits this peculiarity, and the third molar will show a markedly degenerated simple form of tooth. The ellipsoid tooth is a witness to the weakness in the original germ for the molar series.

Professor Cope replied to Dr. Allen's remarks as follows:

I agree in part and in part disagree with Dr. Allen. I was glad to hear him draw the distinction between pathological and biological degeneration. With reference to the tri-tubercular superior molar of man, I still adhere to my opinion that the type of the superior molar is a reversion to the molar of the primitive mammalia; and since the Lemuridæ are the latest type which displays this tooth in the phylogeny of man, I would call it the lemurine reversion, and the lemurine molar. I think this position is self-evidently correct, and that the molar in question is not a monstrosity. The obtuse form of the cusps is not monstrous, but degenerate, and is identical with the modification which takes place in the true molars and the sectorials of the carnivora, where they are similarly tri-tubercular.

Such modification is to be seen in the genus Paradoxurus in the bivenidæ; the sea otters and badgers in Mustelidæ; and the bears in Canidæ.

Professor Cope exhibited the cranium, with molars preserved, of a Tahitian Islander, in which the third superior molar on one side was tri-tubercular, and on the other side monstrous. He also exhibited crania of two species of Paradoxurus, in which the superior molars greatly resembled the human tri-tubercular type. He agreed with Professor Allen that a great many monstrous molars are met with in the dentition of civilized races of man.

THE MASSAGE TREATMENT IN DENTAL PATHOLOGICAL CONDITIONS.

BY W. F. REHFUSS, D.D.S.

THE therapeutic value of the massage treatment in various dental pathological conditions has not been recognized nor appreciated.

That it does possess important and reliable therapeutic qualities, which eventually must recommend its adoption, is not to be disputed. Its adaptability and success in dentistry must necessarily depend on the skill, tact, and judgment exercised by the operator in its application.

The area of our operations is limited to the mouth,—relatively a small field for the practice of massage in comparison with other portions of the body, as on the leg or arm, where massage is performed with ease.

When we consider the fact of the mucous membrane of the mouth being more delicate than the epidermis of the arm or leg, in conjunction with the small area for manipulation, the dentist is confronted with a combination of difficulties that will require of him a greater degree of skill and care in manipulating than ordinarily, to derive the desired therapeutic benefit of the treatment, which, like all operations or treatments, can be learned and appreciated only by experience and practice.

Massage is derived from the Greek, *masso*, I knead, or handle; Arabic, *mass*, to press softly. It is a term generally accepted to signify a series of procedures which are best accomplished with the hands, such as friction, kneading, manipulating, rolling, and percussion of the external tissues of the body in a variety of ways, with either a curative, palliative, or hygienic object in view. In some crude form or other, massage has been practised from time immemorial by savage and civilized people. Those who have recorded their knowledge and appreciation of the value of massage have in almost every instance been men of eminence and renown, either as physicians, philosophers, poets, or historians, from the days of Hippocrates and Homer, who mentions it in the "Odyssey," eight hundred or one thousand years B.C., down to those of S. Weir Mitchell and Billroth in modern times.

Herodotus, the father of history, and others in the fifth century B.C. mention the advantages of external treatment of the human body, and, about a century later, the first rational infor-

mation and treatise on this subject appeared in the aphorisms of Hippocrates.

And so on, through the ages, we find the subject mentioned in history and its use advocated by renowned men. Asclepiades, a celebrated Greek physician, used it in the years 128–156 B.C., and his popularity with the Romans was due to his success with it. It is a fact of history that Cicero, Julius Cæsar, and Martialis, of literary fame, were all warm advocates of its virtues.

The Greeks, Romans, Indians, Chinese, Japanese, and, in fact, the people of all nations of the world, have used massage in some form.

To Peter Henrik Link, of Sweden, credit is given for having instituted what are now well known as the Swedish movement cures.

In 1813 the Royal Central Institution was established at Stockholm, with the patronage of the Swedish government, in order that Link might practise and teach his system of massage and gymnastics. Critics endeavored to prove that his methods were but a revival of that of the Brahmins of India, of the Egyptian priests, of Asclepiades, of Hippocrates, Cleus, and other noted ancient physicians, and that all of the movements that Link advocated were described in an ancient book of the Chinese, the "Cong-Fou of the Tao'-Sse'." However, the merits of his system were proven by the establishment of institutions, similar to that at Stockholm, in other parts of Sweden and in other countries.

Many modern physicians of renown have, by their researches and zeal in advocating its therapeutic value, given the subject such a stimulus that its field of usefulness has been recognized and gradually increased, until it has found its way into general and special branches of medicine with success, and often when other means have failed. It only now remains for the dentist to adopt it in dental pathological conditions to make its application universal in the treatment of all portions of the body.

The Swedish method of manual treatment consists of different movements, termed Swedish movements, the object of which is to exercise the natural functions of a muscle, set of muscles, articulation, or limb, with the beneficial object to overcome existing unnatural or pathological conditions, and they may be either passive or active.

Under the head of passive movements we find the massage treatment classed. In the treatment or mode of application of massage we must, in a measure, follow the scientific methods of

application advised and adopted by leading authorities on the subject in their treatment or manipulation of other parts of the body.

My especial methods of massage are based on those practised by Dr. Mezger, of Amsterdam; these he divides into four different manipulations, viz.:

First, *Effleurage* (centripetal stroking). According to Kurre Ostrom, this manipulation, performed on the arm or leg, consists of centripetal stroking (towards the heart). The stroking is performed with the palm or radial portion of the hand, tips of the fingers, or thumb. The movement is similar to a carpenter's plane, a forward and backward motion..

Secondly, Frictions, which are strong circular manipulations given with the thumb or tips of the fingers.

Thirdly, *Pétrissage* (kneading). This manipulation is performed generally by the thumb or index-finger. In general massage, an operator picks up a special tissue, muscle, or tendon, and, placing one finger on each side of the part, proceeds in centripetal motion with a firm pressure. The palm of the hand may also be used.

Fourthly, *Tapotement* (percussion), which is divided into four kinds:

(*a*) *Clapping*, performed with the palms of the hands.

(*b*) *Hacking*, with the ulnar border of the hand.

(*c*) *Punctation*, with the tips of the fingers.

(*d*) *Beating*, with the clinched hand.

In a modified form these four manipulations are applicable to massage on the oral mucous membrane.

In illustrating the mode of performing dental massage I will take a typical case, and describe the manipulations and *modus operandi* adopted in the treatment of pathological conditions of that class.

First, Our diagnosis must be accurate, for upon that depends the nature of the manipulations, their force and frequency, and the length of time during which they are employed.

We will consider a case of acute periostitis, associated with pulpitis, caused by deposition of tartar around the neck of the tooth, and also from long-standing caries.

The periostitis developed and was followed by an acute attack of pulpitis. The tooth was a superior left first molar. The position of the manipulator is an important matter. In performing manipulations on the left side, the manipulator stands on the right side of his patient and uses the thumb and fingers of the right hand for manipulating, using the left-hand for the application of a napkin

when necessary; and in manipulating the right side he stands to the left of his patient, using the fingers of his left hand if he finds that standing on the right side gives him a cramped and unnatural position.

The position of the hand is also of consequence. The operator uses the fore- or middle-finger, or both, for manipulating, supporting the thumb on the adjacent teeth, as a pivotal or fixed point, and it serves as a support and guide in directing the finger in the manipulating. The forefinger of the other hand serves to hold up the corner of the lip, if necessary. The thumb is used to perform massage, while the four fingers of the same hand rest on or grasp the cheek, also as a guide and support.

The introductory massage consists of *effleurage*,—centripetal stroking around the affected part, and not *directly* over the seat of inflammation. When swelling and pain are present, the centripetal stroking is commenced at the central incisors on the healthy tissue, using the thumb, fore-, or middle-finger for stroking. Continue this gentle stroking and gradually work towards the inflamed membrane. The healthy tissue beyond and around the second molar and wisdom tooth should be similarly treated. Besides the soothing effect, which enables us to approach gradually near the seat of the *periostitis*, and avoid causing much pain, the circulation is pushed along more rapidly, so that exudations are carried off more easily. It is a mistake to commence massage immediately upon an inflamed tissue. If we were to consult the patient's feelings, they would undoubtedly indicate to us to commence at a comfortable distance from the seat of inflammation, and, as has been stated, approach it gradually as the pain lessens and the swelling abates through the open absorbents. This removes the pressure from the terminal nerve filaments, and pain is relieved.

The experiments of Glax and Klemensiewiez have proved that in an inflamed region the lymph spaces are so choked up by the exudations and products of inflammation poured into them, in consequence of the abnormal activity of the vascular walls, that their outlets are insufficient; the efferent vessels are thus compressed and the circulation impeded, so that when we exert pressure upon this inflamed region, already suffering under partial compression of its efferent vessels, it may injure more than benefit. We can now use gentle stroking directly over the inflamed membrane, and follow this by deep manipulation, proceeding in the same manner as before,—gradually from the healthy tissue towards the seat of inflammation.

The greatest pressure should be towards the peripheral end and anterior and posterior to the inflamed membrane, and by thus gradually approaching it there is produced an anæsthetic effect, which lessens the pain; and comparatively firm pressure on the part can now be produced, which but a short time previous was very sensitive to the touch. The object of the *effleurage* (stroking) is to increase the circulation in the blood-vessels and lymphatics. When this stage of the operation has been reached, recourse to "*friction*" can be had, stroking in circles, starting from the anterior part of the mouth and manipulating towards the posterior portion, using the forefinger. This causes a loosening of the tissues, and the effusions and exudations to be spread over a greater surface and brought more easily into contact with the veins and lymphatics, and these are aided in their resorptive functions by the pressure and friction of massage.

After applying friction we again have recourse to centripetal stroking, which is always used before and after friction.

We now come to the third stage in manipulating,—applying *pétrissage* (kneading). This manipulation consists of a series of small circular movements performed by the forefinger or thumb, proceeding from the anterior to the posterior portion of the mouth; and it differs from friction, because in the latter very little pressure is exerted, friction being merely circular stroking manipulations, while *pétrissage* (kneading) consists of friction with an additional pressure. After performing *effleurage* and friction, I use a modified form of kneading, discarding the circular movements, as I find that by using plain centripetal stroking, and giving an intermittent pressure, kneading is more easily and efficiently accomplished. The gum now has a resisting surface—slightly roughened. By pressing the finger along the gum an intermittent jarring pressure is produced similar to that felt by the finger on a piece of rubber, on which, without pressing, a resisting and not a sliding motion is accomplished. It is unnecessary to use much pressure with this mode, as each resistance develops the succeeding pressure. *Tapotement* is the last manipulation. Its application was a difficulty not easily overcome, therefore I devised a small appliance for use in the dental hand-piece, and thereby accomplished the desired manipulation, which is a combination of clapping, hacking, and beating. The appliance consists of a mandrel or shaft of the same gauge as a bur, to fit in the hand-piece of the dental engine, at the other end is a small metal hub, and attached to the hub, at right-angle with the mandrel, are three pieces of

elastic tubing, one-eighth inch in diameter and one inch in length, arranged like the spokes of a wheel, radiating from the centre. When this appliance is revolved in the hand-piece, the elasticity and flaccidity of the small tubes decrease the circumference, on account of the centripetal motion, and by holding it against the gum a light blow is given by each tube, the intensity of which is regulated by the speed of the engine. The object of this form of percussion is to reach the superficial vessels, and cause an influx of blood to the part. The aim of frictions and kneading is to squeeze the pathologically changed parts, and by carrying the diseased tissue into the healthy substances, expose them to a firm stroking, so as to have exudations absorbed by the lymphatics. It is a difficult matter to definitely state the length of time massage should be employed in manipulating the gum. I work from three to fifteen minutes, according to the object I wish to accomplish. It would require about eight minutes to perform the manipulations as just described.

The importance of extreme caution and gentleness in manipulating is not to be overrated, for therein lies the success of the treatment. By frequently questioning the patient we can learn whether the manipulating does or does not cause pain, and regulate the intensity accordingly, and thereby accomplish some relief and benefit; whereas, if the manipulator used undue strength upon such a sensitive tissue as the oral mucous membrane, he would injure rather than benefit the part by his treatment.

I will now consider the physiological effects of massage. Where there is an anæmic condition of the mucous membrane, the importance of some measure to overcome the inactivity and poor nourishment is not to be overestimated. The objective point is to attract the circulation to the parts where the anæmic condition exists. This is done by intermittent pressure of massage, which exerts a simultaneous influence upon all the tissues within its reach, the blood-vessels, lymphatics, nerves, etc. It causes a more rapid absorption of the products of waste, and stimulates and hastens the sluggish circulation. Gentle stroking, though soothing, is in a physiological sense a mild irritant to the superficial vessels. The explanation of the mechanical effect of centripetal stroking is to push along the circulation, and the collapsing vessels cause a suction that aids the returning current.

The outgoing or arterial circulation in the part thus treated is momentarily impeded, an accumulation of blood and a dilatation of the arterial walls taking place when pressure is used. On re-

moving it, the increased volume of blood from accumulation rushes onward with greater force, owing to its sudden liberation into the partially emptied continuations of the arteries.

It is an accredited fact that in heat and massage we have two valuable remedial agents in the treatment of dental pathological conditions. More benefit can, no doubt, be derived from their use than is now accorded them. Moderate heat causes a fluxion of blood to the part, and dilates the vessels. It acts like cold if of a high temperature, causing a contraction of the vessels. To gain the desired therapeutic effect in the application of heat, the theory is to apply it of a moderate degree, 80° or 90° F., to the seat of the inflammation, and gradually increase the temperature.

The principle of massage is the same, for intermittent compression of massage causes a mechanical contraction and dilatation of all of the blood-vessels,—arterial, capillary, venous, and lymphatics,—at every application, from sixty times a minute and upward, and this is certainly sixty times oftener than could be caused by the variations of heat in the same time. The aid to the returning circulation by being pushed along by massage is much greater than that caused by heat, which has a tendency to enlarge the area of stasis, and the exudations are dispersed more rapidly than by heat. In the application of cold, pain and swelling can be reduced in inflammation, but instead of increasing the circulation in the part and hastening the returning current of blood as by massage, we do the reverse, the flow of blood is lessened, the veins and lymphatics are contracted, and the effused products are not easily absorbed, because of this contraction of the vessels, and of all the other tissues. Another danger of cold applications is that they may convert inflammation into gangrene, or may produce sloughing.

The dental pathological conditions in which massage is employed will now be considered, and at what stage it is beneficial. It must be remembered that, according to the requirements of each individual case, massage may be of primary or secondary importance, of no value at all, or even injurious. Briefly stated, it is beneficial and useful in local disturbances of the circulation and nutrition and of inflammations in their incipient stages or after the acute symptoms have passed away, as at the commencement of periostitis, gingivitis, at certain stages of acute or chronic *alveolar* abscesses, etc. Local congestion and irritation can be relieved by massage. In chronic alveolar abscesses the languid circulation can be aroused, which will aid the absorption of the products of waste. In the class of cases under consideration we have a sinus present, and a

continual discharge of pus. It is assumed that the nerve-canals have been rendered thoroughly aseptic, and that no serumal or salivary deposits on the root or necrosis of the alveolus are present.

The condition described is a passive one, the tissue outside of the boundary of pus is torpid. If the granulations be allowed to remain in this condition, they may contract and consolidate in time, causing the sinus to close and the discharge of pus to cease; but we find from clinical experience that the tendency is to take on a retrograde action, gradually involving the surrounding tissue and alveolar process. We must take advantage of this passive stage, and produce absorption of some of these products of inflammation, and cause a consolidation or formation of new granulations. By massage an increased blood-supply is attracted to the parts, which removes the stasis, stimulates and produces activity generally; the tendency is to absorb the products of waste and the effusions. In conjunction with antiseptic treatment by injections, the prognosis is favorable. In acute alveolar abscesses, after the discharge has ceased, and the healing process commenced, massage is valuable, as the progress is more rapid than when massage is not used; but the manipulations should not be too vigorous; two or three treatments suffice in these cases.

Often a patient complains that in a tooth which has been abscessed but which is apparently cured, as the sinus has closed and the discharge of pus ceased, there is a sense of tenderness and soreness when the finger is pressed on the gum over the root of the tooth. This I have noticed is particularly the case in bicuspids and canines. There is a thickening and somewhat flabby condition of the tissues around the roots of the affected tooth. In several cases of this kind I have, by massage, in about three to six treatments, entirely removed such soreness to touch. The treatment of diseases of the peridental membrane, by this process, depends upon the severity of the inflammation. In the incipient stages the object is to abate the swelling, remove the stasis in the circulation, disseminate the products of inflammation, and to restore the normal circulation. The massage, though gentle at first, should be quite vigorous, as a counter-irritant effect is desired in the majority of cases. I have treated a number of cases of apical periostitis, due to the products of decomposition of the pulp penetrating the apical space, causing inflammation and the formation of gases. In these cases the usual treatment of opening the pulp-chamber, removing the products of decomposition, giving vent to the gas, and then inserting an antiseptic dressing in the canal was pursued, but the pain still persisted

in a varying degree, but not as severe as before the treatment. Massage in each instance relieved pain and made the recovery more rapid than is usual in these cases. In various forms of periostitis, due to pulp inflammation, direct irritation of the pericementum, and other causes, I use only moderate massage. The objective point is to produce a slight counter-irritant effect, and to bring the blood into more active circulation, so that when medicines, such as tincture aconite, tincture iodine, chloroform, etc., are applied to the gum they are more easily absorbed. In fact, I always manipulate the gum before applying to it any remedies, as by massage an increased blood-supply is attracted to the parts, and consequently the amount of the medicine absorbed and carried to the seat of the inflammation is greater than ordinarily. In the treatment of periostitis by massage lancing is not necessary unless the local congestion is considerable; then it is advisable to use massage first, which increases the blood-supply and also removes stasis; therefore when lancing is performed the consequent flow of blood is greater and continues longer.

When the tendency of the inflammation is to the formation of pus, we can hasten it by vigorous application of the treatment, which softens the tissues and also, by reason of the heat created, tends to direct the pointing of the abscess at that part of the gum.

The treatment of dental neuralgia by massage depends upon the predisposing cause. If of local origin, due to the irritation of the periosteum of one or more teeth, climatic changes, etc., massage is usually efficacious, otherwise systemic remedies are indicated.

In anæmic conditions of the oral mucous membrane of persons who are of a neuralgic diathesis, massage is beneficial, because it increases and stimulates the local blood-supply. In the treatment of pericementitis and deep-seated pulpitis, much reliance is usually placed in the therapeutic value of counter-irritations. In this respect massage possesses virtues of great efficacy, because by it counter-irritation may be made as slight or vigorous as desirable. When we wish to produce strong counter-irritation, the manipulations are continued with more than usual vigor until a slight oozing of blood is produced by the rupture of the blood-vessels of the mucous membrane. In some persons the oral mucous membrane is more delicate, and therefore more prone to irritation than in others. When such is the case, before commencing the manipulations, the gum should first be rubbed with vaseline, lanoline, or albolene, but if the local irritation produced becomes annoying or painful, tincture krameria, acidi tannici and glycerin, or any astringent or demul-

cent wash will allay the inflammation. If care and gentleness are exercised in manipulating this will not be necessary.

In conclusion, I do not claim massage to be a specific remedy in the treatment of all dental pathological conditions, nor do I advise its use to the exclusion of all other remedies; but its application in the treatment within the past fourteen months of about one hundred and fifty cases, including pericementitis in various stages, acute and chronic alveolar abscesses, deep-seated pulpitis, various pathological conditions of the oral mucous membrane, etc., either alone or in combination with other remedies, and with more than average successful results, has proven to me that massage is and should be, if properly applied, a valuable adjunct to our many successful means of combating dental diseases.

INDEPENDENT DENTAL JOURNALISM.

BY L. ASHLEY FAUGHT, D.D.S., PHILADELPHIA.

MR. PRESIDENT AND GENTLEMEN,—I have no apology to offer to the profession to-night for inviting attention to the consideration of this subject. The very air for the last six months has been full of it; and while, perhaps, it has never been openly discussed on the floor of any association, it is nevertheless to my mind a topic upon which many, like myself, may desire information; and a comparison of ideas ought not to prove barren of beneficial results. Certainly the floor of an association like this is a fairer field of combat than the pages of any journal, dependent or independent; and the cool impartial opinions of readers and contributors may weigh more justly in the balance than the mere statements of assertion and denial from persons in more interested positions.

There is no good reason why we should not freely discuss our journals, and I shall open the way for it. If we do not tell each other to-night our thoughts in reference to them, and what we regard as best in them, or needful for their improvement, the omission will not be due to lack of invitation or of opportunity.

In order that we may intelligently discuss the subject, a slight *résumé* may not be inappropriate, and to this end I propose the query, What is the object of dental journalism? The journals of any art, science, trade, or manufacture are primarily the outgrowth of a desire on the part of those most interested in such subjects, though widely separated in point of space, to communicate to each other, for mutual benefit, the progress made and the new ideas developed from day to day; and, secondarily, the result of a wish of their publishers to further their personal interests.

Dental journalism, therefore, found the springs of its birth in a desire to supplement the early meagre college training, and has ever since drawn its life from the veins of a profession to which it relates as a post-graduate course.

The little band of dental pioneers, shivering under the rude cold blast that usually meets early aspirations, turned from the closed doors shut by the powers then in control of the healing art, and sought to nurse the fitful flame of the smouldering spark by sweet communion of kindred hearts. The Baltimore *Dental Journal*, the *Dental Register*, the New York *Dental Recorder*, the *Dental Intelligencer*, and, best of all, the *Dental News Letter*, came into existence, and the dentists who wrote for them, though possessing the

doctorate in medicine, signed their articles "John Brown, M.D., Dentist." Too small to properly represent the young nursling, the *Dental News Letter* was succeeded by the *Dental Cosmos*, and the imprint on its first page under the topic, "Our Enterprise," suggests that it seeks to "fairly cover the dentists' world of science and practice;" that "the meaning of the title is exactly the intention of the publishers," and that "the *Dental Cosmos* is pledged to the dental public to do whatever a journal can for the good cause of professional improvement, for the profession's advancement in its usefulness, self-respect, and public regard, and for strengthening fraternal courtesy, justice, and co-operation among the men who have the destiny and responsibility of the profession in their hands." This pledge was amply fulfilled during the succeeding years, and represented all that there was of any note in dental journalism up to 1872. At this date one whose memory is yet green, and whose professional spirit will ever be revered, in retiring from its editorship, stated that its primary object had ever been "the elevation of the professional standard to the highest possible point of excellence," . . . and "the views advanced have been offered for what they were worth, consulting more what I believed to be the best interests of the profession than what might prove to be popular, . . . and I desire that its record in the future, as an exponent of the interests and aspirations of the profession, should be equal if not superior to the past." With this benediction the *Dental Cosmos* passed from his hands, and in the same number of its issue the publisher states: "It is our intent and earnest desire to make the *Dental Cosmos* a practical exponent of the science and art of dentistry, . . . to supply all that the practical progress of the medical and dental professions can be made to afford." With the mantle of high professional spirit thus falling from the shoulders of one and resting so gracefully upon another, is it a matter of wonder that no true dentist to-day can afford to be without its pages, even though it may have fallen into a popular error?

From about the year 1872 up to the present time, as a result of natural professional progress, and perhaps stimulated from time to time by other minor impelling powers, the journalism of dentistry has greatly multiplied until the immediate furnishing seems most replete.

We sit not down to-day to a meagre table, but we have a choice of viands. It is perhaps inopportune, as well as difficult, to select and indicate any one dish as the most nutritious, but the seasoning in them all calls for notice and seems unpalatable in two respects.

As regards the pepper, most of the cooks seem to be in doubt which will suit best the popular palate,—red or black,—and so they use indiscriminately both,—"profession"—"specialty,"—and those who partake question whether the salt to be used shall be coarse or refined. Now, gentlemen, there are some among us who recognize that the real difficulty lies not in the salt at all, but with the pepper, which ought always to be red and never black. This can be best shown in a consideration of the first word of our title, "Independent Dental Journalism." The mixture of black and red pepper since 1883 became so evident that, with a view of sparing further infliction to sensitive nerves, I wrote a letter to the *Independent Practitioner*, under date of October 11, 1888, querying what profession could be possibly meant when one used that word again and again in articles on "Dentistry, a Specialty in Medicine?"

I may not be denied here a short quotation from my letter. "Every attentive reader of the dental and medical literature produced during the last five years will recognize the pertinent force of the above query. . . . From the time that Chapin A. Harris and his coadjutors made overtures to the medical colleges, endeavoring to have dental professorships incorporated in them, and the scornful rejection of their propositions, up to about 1883, dentistry was not confounded in thought with medicine by any one. It was understood to have its own literature, colleges, societies, etc.; and the medical fraternity lost no opportunity to give prominence to the fact that dentistry had nothing to do with medicine.[1] Dentistry as an independent profession, however, thrived and grew, and made for itself so prominent a position that its respectability and strength were felt far and wide. Medicine, ever jealous of her supposed prerogative, has noted the healthy pulse, and during the last five years has made great change in her attitude and from her original policy. During this period a persistent attempt has been made by the medical profession to have it understood that dentistry is a specialty in medicine.[2] The effort has filled our literature with much interesting reading bearing upon the subject, but has in nowise been able to make dentistry a specialty in medicine; but, rather, has continually emphasized the fact that the healing art is in the hands of two great distinct and separate branches,—medicine and dentistry. Each distinct and independent.

Every article that has been written, every speech that has been

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[1] See *Dental News Letter*, 1851, p. 109, and *Dental Cosmos*, 1874, p. 325.

[2] See *Dental Cosmos*, 1887, pp. 135, 405, 460, 516.

uttered, advocating dentistry as a specialty in medicine is filled with the expression, "the profession." Such emphasis shows how deeply implanted dentistry is as a "profession."

According to this view the salt has little to do with the taste, for the word "independent" does not concern a consideration of journalism separating from a supposed interest of a particular college, society, or manufacturing establishment (coarse salt), and conducted in the interest of the dental profession, by the profession, of the profession, and for the profession. (Refined salt.)

As another has tritely put it, "The question is not *where* is the literature of a profession purchased, but *what is its character?*" For my own part, gentlemen, if the manufacturer of dental requisites can produce a better journal, it matters not whether it emanates from a shop or a college, and God speed to him who makes journals more useful to those who subscribe for and read them. Still declining to express an opinion as to which of the many is best, I venture the assertion, without fear of successful contradiction, that the house from which one of them emanates has done much to give to dentistry the cast of an independent profession. We may cut loose from the manufacturers so far as journalism is concerned, and we may by the most strenuous efforts endeavor to attach ourselves to the medical profession as a specialty; but we will never be successful in our identification with the latter, and we will always find ourselves classified with the former, as we now are by the census office, unless we seize upon the true meaning of "independent," and stand up for ourselves, and for what we are, as expressed by our title D.D.S.

Dr. Norman Kingsley voiced this in true old-fashioned Anglo-Saxon when he said, not long since, in speaking of a kindred topic, "Hardly a speaker has been on his feet that has not talked about 'our specialty' and in the next breath about 'our profession.'

"One gentleman, in his remarks about independent dental journalism, said, what I did not know until this evening, that this Society (New York Odontological) has committed itself unanimously to independent dental journalism. Now, as far as I can find out, the independent dental journalism which this Society has committed itself to, if it has at all, is made up of the veriest twaddle. Independent of what? Independent of a company of publishers that are able to publish a thoroughly creditable journal? Is that independent dental journalism? Not according to my mind at all. Independent dental journalism should represent dentistry in its independence.

"I tell you, gentlemen, that what is now doing more to menace the integrity of the dental profession than all else is not the men who are preparing materials and furnishing goods for dentists' use, but it is the class of men who are trying to attach dentistry to another profession."

This, gentlemen, is the truth,—sound solid truth,—and we ought as dentists to stand up for dentistry as dentistry, and, as an independent profession, engraving upon our cards and putting upon our printed matter, upon our window-sills and upon our door-plates, in fact upon all that goes before the public, not Dr. ——, but ——, D.D.S., thus acknowledging everywhere that we are dentists, and proud of being dentists; and start out plainly and boldly with real independent dental journalism.

THE RETENTION OR REMOVAL OF THE SIXTH-YEAR MOLAR,—WHICH?

BY THEODORE F. CHUPEIN, PHILADELPHIA.

It is not the purpose to deny or affirm whether the sixth-year molar belongs to the temporary or the permanent denture, but it is the purpose to show that experience proves that its *timely* removal redounds to the benefit of the other teeth of the permanent set, and, in the large majority of instances, to the comfort of those we serve.

It has proved itself to our satisfaction that if this tooth be removed in time, the two bicuspids, on each side and in each jaw, will not be in such close contact as to endanger their proximate surfaces by decay, those surfaces which give us such care, solicitude, anxiety, and trouble in our efforts to arrest caries when it has once gained a foothold. It has been demonstraed, in the large majority of cases, that removal at the proper age will induce the second or twelfth-year molar to work forward and occupy nearly the same place formerly occupied by the sixth-year molar, and this without tilting, leaning, or assuming the least malposition, and that both the second molar, as well as (subsequently) the wisdom tooth, will take normal positions in the jaw with a free, easy space between each, whereby decay on the proximate surfaces of these molars as well as the bicuspids is largely the exception rather than the rule.

It will be admitted by nearly all, if not by all, dentists that decay on the proximate surfaces of the bicuspids and the three molars are the localities, *par excellence*, that are frequently most prone to decay, and are the surfaces most difficult to combat.

All statistics prove that the sixth-year molar is the tooth which decays more frequently, and on all surfaces, than any tooth of the denture, and that, like a decayed peach in a basket of such fruit, it communicates caries, by contact, to its neighbor (if caries is communicable in teeth, which we do not advance), and thus spreads ruin among the good seed.

The sixth-year molar, in my opinion, is often the bane of the denture, the black sheep of the flock. After the most careful work and the utmost solicitude on the part of both patient and operator, failure to preserve it is the result. Or, if it be preserved, is the victory commensurate with the labor or the pain incident to such

victory? Or, are after-results beneficial to the rest of the teeth? I say no!

The jaws of the present generation do not seem to be large enough for the accommodation of thirty-two teeth. Witness the large number of cases of irregularity of the teeth which we see in people of our time, when the jaws have to be spread or enlarged to accommodate the teeth, or where teeth have to be extracted in order to make room. If, then, we can secure a better condition of the denture by the removal of this tooth, what good reason can be advanced for its retention?

It has been asserted that the second molar will tilt, and thus give a malocclusion with its antagonistic teeth, if the sixth-year molar be extracted; but such a result will not occur if its removal be made at the proper age or time.

It has been advanced that the proper comminution or trituration of food cannot be accomplished as well if the sixth-year molar be removed as it can when it is retained. Yet we very much doubt this position, when, by its retention, frequently all the proximo-masticating surfaces of all the posterior teeth are so largely occupied by fillings that these fillings cannot offer as good means of communication as if the teeth were in tact. Will it be contended that the proper trituration of food can be as well performed by teeth which are filled (however faithfully the contouring of such fillings restore the normal shape of the teeth) as it can be by genuine tooth-tissue? It has been asserted that if this tooth be extracted too soon it will cause an impairment of digestion; not only this, but, the bulk of mastication being thrown on the teeth anterior to it, this extraction will cause a change in the features of the patient, giving them an apish or bull-dog expression. It may be doubted whether such might be the case if the extraction were done too soon, but nothing is suggested of this kind. At the time it is advised to extract this tooth, all the eight bicuspids will be fully developed, and the patient will not be without a molar to chew on for more than six or eight months at the farthest. Such a change in the features as is intimated, and such an impairment of the digestive functions, could not be brought about in so short a time with eight good back teeth to chew on. Indeed, very many adult persons go through life with sometimes even fewer posterior teeth, and these never think of resorting to artificial grinders to assist in mastication, being quite able to do all their chewing with eight bicuspids or less, and no molars at all, and yet do not suffer from dyspepsia or have apish expressions of countenance. It must not

be concluded that it is advised to extract the sixth-year molar as soon as it gives pain from the effects of decay; such is not the idea. When this tooth shows early signs of decay, it would be better that every means known be used for its preservation up to a certain time of life, after which I would advise its extraction in the large majority of cases. The time for the proper extraction of the sixth-year molar, it must be stated, cannot be set down to any specified time any more than the erupting of the teeth can be positively determined, some of these erupting earlier and some later, in different subjects; yet, ordinarily, from about the tenth and a half to the eleventh and a half year is near the period, the eleventh year most generally. I favor the extraction of these four teeth, but am inclined to the belief that the extraction of the lower should precede that of the upper molars by from six to nine months, because the lower teeth frequently erupt before the upper ones. A very popular dental writer has stated that "the overcrowded condition of the teeth causes caries, imperfect mastication, incorrect enunciation, and deformity of feature." But while I quote this author in support of the position, it is not to offer his testimony as binding, except in the matter of one,—the "cause of caries,"—because I do not believe he referred to the crowded condition of the teeth except in so far as their malposition in the jaws was concerned. Yet I do hold that even in their regular position, when forced against each other in closer contact than is admissible from the size of the arch or intended by nature, such contact tends to, or is a most fruitful cause of, decay.

I do not wish to infer that decay is wholly due to close contact, for it is known that teeth which are widely separated are sometimes found with caries, and again, it may occur on surfaces that are never in contact, yet even when a tooth has begun to decay from contact with its neighbor, necessitating its removal, the decayed tooth seems, if not to assume a retrograde process, at least not to make as rapid progress in the consumption of tooth-tissue as it would have done had its neighbor been in place.

It will not be advanced that once a tooth has been filled it will not decay again. If such a consummation could be arrived at; it would be a joy indeed. It is the recurrence of caries after filling that makes the dentist seek the solution of the cause. This or that reason is advanced, most often the lack of thoroughness or faulty manipulation, yet the effect always remains. But whatever be its origin, the dentist must remedy the disaster, though he has to fill and refill again and again at each recurrence of decay.

When such proximo-masticating fillings increase in size at each recurrence, not only subjecting the patient to severe pain and strain in the preparation and filling, the dentist to great fatigue, the parent or relative to the payment of the fees these necessarily expensive operations entail, should not any means that promise the bringing about of different and improved results be adopted for humanity's sake? What is the use of continuing on a beaten track that does not lead quickly and most certainly to the coveted goal? And if the results, for the patient's benefit, can be brought about by the system advanced, is it not a duty we owe them to try it? And is it not often the case that the oft-repeated filling so demoralizes the patient that, in despair, rather than have the same thing done again, they resort to wholesale extraction, and hang their hopes, despite every argument to the contrary by their dental adviser, in the substitution of artificial teeth?

But it may be advanced, "If such a condition could be brought about, what would become of the dentist's art? It is caries which dentistry has to combat, and principally in those teeth and those localities which furnish the bulk of employment in dentistry." I am sure that it is only those who are actuated by cupidity or mercenary motives who would bring forward an argument like this in rebuttal. Dentistry desires to be allied with medicine and surgery; but can an instance be shown where a physician has ever failed to advocate a measure that would point to or foster a system for the prevention of disease? May it not have been said that prevention of disease would bring about the downfall of medicine? Yet, did that prevent the noble Jenner and the equally noble Koch from promulgating their systems for the promotion or cure of small-pox and consumption? These diseases are wasting and tedious, and would naturally furnish a very large employment to the physician; but can human suffering and personal aggrandizement ever be placed in the balance?

I assure you I am in earnest in this matter, and have my patients' interests as much at heart as any man among you, and I feel sure that its performance will not only save the patient very many severe and painful operations, but the dentist severe and tiresome work.

The evidences of the truth of this position are to be seen in operations performed, of the like character, by other dentists, and in all cases seen benefit has resulted.

I present you an ideal case in the model sent around. You will perceive on one side of the mouth, where the sixth-year molar

has been retained, how all the proximo-masticating surfaces of the teeth have been filled extensively, whereas, on the other side, where that tooth has been removed, how all the proximate surfaces have escaped decay. This is attributed to the freedom from close contact and the facility with which these surfaces can be kept clean with little trouble to the patient. It may be considered good theory from æsthetic grounds to retain the sixth-year molar, but I know it is good practice for our patients' comfort to remove it.

Is it not more reconcilable with common sense to save twenty-eight out of the thirty-two teeth which are given to man than to make the attempt to save the whole thirty-two and fail in the attempt? For is it not a failure, or next door to it, when (whatever may be the cause of the recurrence of decay) cavities, once filled, have to be refilled again and again in order to keep back the inroads of the insidious enemy?

Is it not more reasonable, and will it not be admitted, that the patients' interest, health, and comfort are better served, to say nothing of the operator's, when twenty-eight teeth are preserved, with only, perhaps, a few simple places filled, than to try to save the thirty-two, with such results as are observed in the large majority of cases? And would not any patient prefer to have this many teeth, almost, if not quite, intact, rather than thirty-two tumble-down crowns, half tooth and half gold, if the case were submitted to them? In a remarkably fine paper recently read before the Southern Dental Association by Dr. W. H. Atkinson, he uses the following language: "The highest use of any profession is to so instruct the people that they shall be in such healthful condition as not to demand a remedy. There is no reason why dentists should not be entirely competent to prevent disease more often than to treat it. The time has come when prevention is more important for them to turn their attention to than treatment." Who will not admit that he is a better physician who can prevent disease than he who can cure it? So that the old proverb of "an ounce of prevention is better than a pound of cure" is an acknowledged truth.

We could advance many arguments in further proof of our position, but we have said, perhaps, more than enough to set the matter before you, and therefore leave it for your consideration.

DISCUSSION.

Dr. F. M. Dixon.—I must take exception from beginning to end to Dr. Chupein's paper, and I do it with all kindness.

This question, Mr. President, I thought had been talked to death, was dead and buried; not because it was unimportant, but because I believed dentists had made up their minds that it was a subject requiring an amount of judgment which every man does not possess, whether the sixth-year molar should be extracted or whether it should not be; or whether it should be extracted at a certain period. Now, my impression with regard to this tooth is—I say it honestly—that it is one of the most important members of the human mouth. It is the broadest on its grinding surface, and it occupies the central position among its fellows.

Why should it be extracted when there are teeth in the mouth that are not worth one-fourth what the sixth-year molar is, simply because the grinding surface is such that they cannot be brought into place as the sixth-year molar can? We cannot always judge whether we should keep it there until all the teeth are in place and the child, or young man or woman, has grown to maturity, for it sometimes happens that when the sixth-year molar is extracted the teeth do not come together.

Not in one solitary instance do I recollect having lost a first molar in practice, which now, I am happy to say, I never think of extracting. The difficulty in saving this tooth is that it is not taken in time. If I fill a sixth-year molar when the cavity is small, and the filling should fail, it is a serious matter to be obliged to fill it again. As it is the most useful tooth, is it not worth the trouble? If sometimes it is necessary to extract a tooth, why must we take the best and most useful in the mouth instead of one less important? Very often the cervical margin of the first molar and second bicuspid come together more tightly than at the upper surface. Then I say, if necessary to extract a tooth, why not take the second bicuspid? and then will be left a perfect set of teeth.

I should like to hear from some of the other members.

Dr. G. L. S. Jamison.—I feel that it would be rather a difficult task for me to speak at length after Dr. Dixon, and I feel rather out of place. Of course my experience has been more limited than his, but I might say that, limited as it is, I quite agree with what he has said. I firmly believe that the sixth-year molar is one of the most useful teeth.

This afternoon about the last patient I saw in my office was the case of an improper extraction of a sixth-year molar, causing a deformity of the young man's face. He called my attention to it. He said that the left side of his face was much fuller than the right side. I examined the mouth and found that the sixth-year molar

on the right side had been extracted, and that the teeth had grown in such a manner that occlusion was not by any means perfect. Altogether the young man could not experience any satisfaction, and naturally avoided chewing on that side of the mouth, and, as he was a rather good liver, I presume the muscles on the left side were unnaturally developed, causing a deformity in the young man's expression.

If this tooth is to be extracted, it should be done before the eleventh year if the circumstances are such as to warrant it, for the simple reason that if it is left in position until the eleventh year it will soon be followed by the twelfth-year molar, and already probably this molar has made such progress that its position will not be directly in the place of the sixth-year molar, as it would be had the latter been extracted when the patient was possibly eight or nine years of age.

The essayist laid great stress on the fact that the sixth-year molar was the cause of general decay. Now, that has not been my experience, and it seems to me that if a patient is put in your hands before he is eleven years of age, that by filling and refilling, if necessary, this tooth can be kept in position and can be made serviceable and can be saved as long as any of the other teeth in the mouth. I have seen a great many of Dr. Dixon's patients, through his kindness from time to time. I don't believe that he has in many cases ever advocated the extraction of the sixth-year molar, except when he could not possibly save it by filling.

As far as I am personally concerned, from my limited experience, I would say that it is better to sacrifice either the first or second bicuspid rather than the sixth-year molar. Of course it is a subject that requires great judgment, and there are many circumstances to take into consideration, but I am in favor, on the whole, of retaining it and sacrificing some other tooth.

Dr. E. C. Kirk.—If I apprehend Dr. Chupein's position exactly, I understand him to advocate the extraction of the sixth-year molar in a majority of cases as a prophylactic measure against the decay of other teeth, and claims the advantage that decay by contact with other teeth is thus avoided.

In general I am thoroughly opposed to the practice of extracting the sixth-year molar for such purposes. It does not seem to me to be the right line in which to expend our energies towards obtaining prophylactic results, so far as decay of the teeth is concerned. I see no reason why the sixth-year molar should decay sooner than the other teeth except that it is exposed to action

longer than any other tooth, and if it is properly taken care of there is no reason why it should be more vulnerable than others. I believe the gum margins in such cases more than balance any good we get from the retardation of the process of decay. Therefore, as a prophylactic measure, I would be opposed to it. Of course there are individual cases where the sixth-year molar could be extracted to advantage; cases of peculiar irregularity where the teeth are so damaged that it should be taken out the same as any other tooth, and not because it is the sixth-year molar.

I thoroughly agree with Dr. Dixon that it is the most valuable tooth in the denture. I think I have nothing more to offer on the subject.

Dr. L. Ashley Faught.—Some years ago, at a meeting of the Pennsylvania State Dental Society, I read a paper on "Oral Hygiene." The gentlemen gathered at that meeting were very much on the lookout for mistakes, and some of the papers that were read were pretty severely handled, and when my turn came to read my paper, I had considerable doubt as to whether I would read it or not, considering the fact that I had taken the opportunity of saying something in regard to the sixth-year molar. I thought it might possibly prove a point of attack for those who were looking for victims; but I had a redeeming clause in it, it seems, and they let it alone, and that redeeming clause was: I would extract the sixth-year molar *for cause;* and that seemed to save my head at that time. Nevertheless, I am surprised that we should discuss to-night the matter of the extraction of the sixth-year molar, and that any one who has had an opportunity of viewing mouths and examining diseases of the teeth should desire the retention of this tooth in all cases. The only thing that I can say for those who favor its preservation under all circumstances would be that they have not examined mouths where the sixth-year molar had been extracted. If they had had an opportunity of seeing this extraction done as I believe it ought to be done, I think they would feel the same as I do in regard to it,—that it is a benefit.

I must say that I do not believe in the wholesale retention or removal of the sixth-year molar in all cases, under all conditions, and under all circumstances, but still adhere to my original statement,—for cause. I think there are some mouths where it would be highly injudicious, and I think many times it is the best thing for the patient.

I have seen case after case in my own practice where the removal of the sixth-year molar was indicated, as when the twelfth-

year molar is beginning to make its eruption. I believe that if the sixth-year molar is removed at that time, under almost all conditions, unless there be some other mechanical influence exerting its power upon the tooth, that the twelfth-year molar will come forward without turning or disturbing the normal occlusion of the teeth.

That is my position in regard to the sixth-year molar. I believe it to be sound practice, and believe that great good can be done to our patients.

(Question asked as to what is meant by the clause *for cause.*)

It is hard to describe to another those particular things which you would recognize. I am in the position of the judge who gave his timid young friend coming to the bench this advice: You are going to be called on to give your opinions; in doing this, never give your reasons, because in nine cases out of ten your opinions will be right and your reasons wrong.

With judgment, care, and watchfulness, we recognize that under certain conditions certain things are intended, and we know that with due attention good results will follow. It is impossible to transmit that acute knowledge from one person to another.

The President.—Give a typical case.

Dr. Faught.—Well, if I had a sixth-year molar largely broken down in teeth that would have a tendency to disintegration, showing a weak structure, coming on to that age of life in which perhaps one or two of them are involved in trouble, I should have no hesitation in removing the sixth-year molar. I believe that in such a case the extraction of the sixth-year molar will give you, instead of a bicuspid and small wisdom tooth in the arch, which is of very little use, a twelfth-year molar in good position, and the other molars will also develop and come forward to do the same service.

Dr. S. E. Gilbert.—The only thing I can say is that a man must use his brains. There are cases that I have seen where the extraction of the sixth-year molar, and also its retention, was very beneficial.

I have a case in mind now where the extraction of the first permanent molar has run through a whole family. I cannot express the terms that that family can use in disapproval of it, for the reason that it was extracted at the wrong time and the teeth stand in irregular position.

As Dr. Kirk has said, there is more injury to the gum margins than will be benefited by removal. I do not believe in separation. I have had considerable to contend with from teeth having been

separated by filing, and if there is any nuisance in a man's mouth it is that. I do not like to say anything against another man,—in fact, I will not of a legitimate practitioner,—but it is pretty hard work to smooth over this mode of practice.

I do not believe in the wholesale extraction, neither in the wholesale retention. You must use your judgment. There are some cases where, if they are removed, it will save an immense amount of trouble afterwards. In my own mouth I believe the denture would be in great deal better shape if the sixth-year molar had been removed at the proper time.

Dr. Rehfuss.—I am pleased to hear this paper of Dr. Chupein's, and I feel gratified to have heard the different speakers condemn the extraction of the sixth-year molar as an invariable rule. Of course it is recognized, as the previous speakers have said, that at times its judicious extraction is a benefit, but it is difficult to recommend this operation.

The sixth-year molar is understood to be the connecting link between the first and second dentition, and I think it would not only be malpractice, but wilful malpractice, for any one to presume to extract the sixth-year molar previous to the twelfth year; because we know that between the seventh and ninth year, or even as late as the eleventh year, the sixth-year molars are the only teeth that are in place for masticating. It brings the anterior teeth in occlusion, and deformity results,—unnatural pressure on the upper teeth by the lower, which causes protrusion of the upper teeth.

Now, the authorities that favor the extraction of the sixth-year molar say that the time to do it is just previous to the appearance of the twelfth-year molar, and that prevents tipping; but when this is not done we should let it alone until the eruption of the wisdom teeth, so the space will close up.

In addition, I might say that I disagree with some of the authorities that the sixth-year molar, in texture and quality, is inferior to the other teeth in the mouth. That is, from a limited experience; but still I have noticed that the second bicuspid decays oftener and more frequently than the sixth-year molar; and I also agree on that point with the previous speaker, that if any teeth are to be extracted, I would sacrifice the second bicuspid in preference to the sixth-year molar.

Dr. Gilbert.—I have a son who is not eleven years old, yet the twelfth-year molars are thoroughly formed, and they have half their length exposed. I think it would be rather late to extract. I think Dr. Faught's idea of extraction is nearer the proper time.

Dr. Rehfuss.—I think it ought to be extracted previous to the twelfth year. In speaking of the twelfth year, I was speaking of the authorities who are in favor of extracting the sixth-year molar.

Dr. Kirk.—I would like to ask if any one has ever seen a case where the extraction of the sixth-year molar does not make a difference in the appearance of a set of teeth, and if it could not always be told that a tooth had been extracted by the appearance of the space and the gum margins, etc.? I have never seen a mouth where the tooth has been extracted and the space closed up, but that the gum festoon looked different. There is also nearly always some little tilting forward of the twelfth-year molar.

I have pursued, at one time, the extraction of the sixth-year molar as a prophylactic measure until I convinced myself that I was on the wrong track. I have tried it, and I speak of it as the result of my experience in my own work and what I have seen in the mouths of patients who have come from other dentists; and where I extract now it is for the correction of some special irregularity, not with the belief that it will prevent caries; and for the first reason I extract the second bicuspid as frequently as the sixth-year molar.

Dr. Chupein—I have observed it more in the lower jaw than in the upper. I have seen it in the upper jaw where it would be impossible to detect whether the first molar had been extracted.

I would say that I rather object to waiting as long as Dr. Faught did for the eruption of the second molar pushing through the gum before permitting the first molar to be extracted, and I think it would be preferable, as soon as we notice a little swelling, indicating that the tooth had not yet quite protruded, to extract it, rather than wait until it has come through the gum thoroughly; but if you extract it before that time it will come forward until it will nearly occupy the position of the first molar.

Dr. Ambler Tees.—I must say that I approve a great deal of Dr. Chupein's paper. Many years ago I tried to save these teeth, and filled and refilled, and patched up the mouths of my patients, but for many years I have changed my tactics, and it has been my practice to order the extraction of the sixth-year molar, when proximal decay is much advanced, at eleven years of age, and I do this at this period to avoid the tilting that has been spoken of by several gentlemen.

For instance, if the lower molar shows proximal decay, I order its extraction at the age mentioned, and I also order the extrac-

tion of its antagonist, whether it indicates decay or not. I do this to give perfect occlusion.

Several years ago a young patient from one of the boarding-schools was sent to me to have two devitalized lower molars treated; the crowns were half decayed away. She was a young lady about sixteen years of age. From my experience I knew that those teeth would have to come out, and that in a very short time. One of the lady teachers at the school came with her. She said, "Now, doctor, we have been ordered by the dentist in New York to come to you for the treatment of those teeth. He has been treating them for some time, and recommended us to you to continue it." I told her then that my conscience would not allow me to continue the treatment; that I would either have to send the patient back, which was almost impossible, or else refuse the case. The daughter said, "We have been sent to you, and now we are going to let you do as you think best." I told the young lady that the best thing to do was to have the teeth taken out. She said she wanted to place herself in my hands, and she insisted on my doing the work. This I did, and treated and filled the other teeth. The first of July I sent my bill to her father, and on returning from my vacation I found a letter from him, censuring me very much, and said that he had never paid a bill so reluctantly. He represented that I had extracted teeth by the wholesale for his child, and that he would never place her in my hands again. I simply wrote to him that I had done my conscientious duty, and asked him to make a careful examination of the young lady's mouth after two years and write and tell me whether he could discover that any teeth had been extracted. I have not heard from him, though that has been four or five years ago, and I know that there will be no spaces between either the upper or lower teeth. The twelfth year molar will come up to the bicuspids, showing a case like Dr. Chupein exhibited of the approximation of all the teeth.

Dr. A. W. Deane.—In 1879 or 1880 I heard you, Mr. President, with some of the others, advocate the retention of the sixth-year molar at the Pennsylvania Dental College. From that time on I have thought best to save all the teeth that God has put there, unless it be the wisdom tooth.

I have under my care about two hundred girls, and have had for six or seven years, of the St. Joseph's Home, at Seventh and Spruce Streets, and I would be very glad to have any dentist go there and use my name and examine any of the mouths, and see if they can find a mouth where they think the extraction of the sixth-year

molar would be beneficial. I work just as hard, perhaps a great deal harder, to save a sixth-year molar than almost any other tooth, unless it be a lateral. A great deal of trouble is experienced with the first permanent molar, yet I cannot see where it is beneficial to extract the tooth; as these gentlemen who advocate its removal say that they cannot tell you when nor why to extract it, and Dr. Faught says there is just one time to remove it. What is that time? He cannot tell us. Dr. Chupein says extract it, but why? I do not see this shown in the case he passed around. We find many teeth that do not touch each other in the mouth anywhere at all, yet there are cavities in the proximal surfaces. Why is this?

In my own mouth the sixth-year molar was extracted when I was quite young. My mother took me to the dentist, and I had the tooth removed in the lower jaw, and the twelfth-year molar is tipped over, and if the man who extracted it were to receive all the maledictions I have passed on him, from food getting down and pressing the gum and causing the pain I have suffered, he would not need any Hades hereafter. The other sixth-year molar was extracted while I was in college, and that bothers me quite as much.

Dr. C. H. Littleton.—I think the extraction of the sixth-year molar very bad practice. Its strong support to the arch and its broad surface, so useful in masticating, are of sufficient importance to command our best skill in its preservation. I believe the advocates for the extraction of this tooth usually recommend it when the teeth are soft and much crowded in the arch. In such cases I have entirely satisfactory results by extracting the second bicuspid above and below.

My predecessor, Dr. Gates, had under his care three brothers who married three sisters. In these families there were twenty-eight children. All of their teeth were very soft, with a great tendency to crowd in the arch. When they came into my hands, Dr. Gates had extracted the second bicuspid above and below for eleven of them. Since that time I have had the same operation performed for eight more. In every case (except one which I have not seen) the spaces are entirely closed without the slightest irregularity of the teeth. Heavy approximal pressure is undoubtedly the cause of much decay in soft, chalky teeth. In such mouths, often, the approximal surfaces of the bicuspids are flattened, admitting of decay when it would not otherwise occur. The first molar will harden with age, and I have generally found it much easier to save than the second bicuspid.

Dr. W. G. A. Bonwill.—I rather compliment this gentleman on having the courage to come here and read a paper of that kind, but I am not with him; I compliment him, nevertheless, for his effort; but if I can raise my hand or voice to convert him, I would willingly spend an hour or the whole evening. It is very hard for a dentist to practise thirty years without having made some mistakes. Show me a man who has made no mistakes, and I will show you a man who has done nothing.

I do not agree with my friend. I do not see any way of settling this question or settling any of the difficulties that exist. We have no system of dentistry, although we have a number of volumes said to be the American System of Dentistry, but who can practise by it? Can we give these as a safe guide to the beginners in the profession? Can we give them as a complete guide? Can we go to any one individual man in this assembly and get from him that which would suit us in practice on all occasions?

There is no system as yet, and I am very glad he has attempted to make one for saving the teeth. I have said of others, where they are using all amalgam or all plastics, if they can save teeth the way they do and cannot save them in any other way, God speed to them.

How are we to get clear of all these things? This gentleman comes here and tells us why he does it, and I believe he is a very honest man and speaks from his convictions, but still, at the same time, I would like to tell him just where he is doing wrong.

I have done a great deal of extracting for people who had not the money and time to have their teeth filled, and I have seen decay as the result of this extraction. I have had several cases in my office from other and older dentists, who very early in life extracted the sixth-year molar with most happy results, so far as the second molar coming forward and filling up the space.

When you come to take into consideration how nicely a crown can be put upon a root of the first molar, and serve the purposes of mastication for years, there is hardly any occasion for extracting.

I find it really the most important tooth in the mouth when the mechanical structure of the mouth is considered.

Of all the cases that have come to me from the hands of others where the first permanent molars have been extracted, I have yet to see, except in a few individual cases, where it would have stopped caries. Extraction will cause the rest of the teeth to fall back in the arch.

The first case I had was a gentleman whose teeth were so de-

cayed it was impossible for me at that time to preserve them. All of his lower teeth were badly gone on the approximal surface at the age of twenty-one. I had to remove from first bicuspid the whole enamel. It was pitted as if it had had the small-pox. I left nothing but a cone standing upon its base. I cut off the entire distal surface of that tooth. For thirty-three years that gentleman has been coming to me, and he has never lost one of the lower teeth. The sixth-year molar is there, and he never had a tooth out until about three weeks ago. And all the upper teeth gone at the age of twenty-one. The first bicuspid, without a trace of enamel upon it, remained in that condition for thirty-three years. All at once it commenced to show signs of decay above the edge of the cervical border; I filled it. The next year another place commenced at the very top of the cone. I filled that, and I have been watching it with the greatest solicitude and care ever since. So, when I look back and see the success of that one case, and how much could be cut from the surface and still save, why, sooner than extract a molar now, I would cut every particle of its enamel off and put a crown on. Besides, as I said a moment ago, crowning the teeth is such an important thing that for that reason alone I would not do it.

I want to propose one thing here to this Society. I think the best way of getting at this thing is to measure somebody else's half-bushel by our own. There are many who have cases of children, and they are generally willing to come before societies. If we could have a fair understanding with each other and with our patients, we could show these things. I am willing to bring my own children, and plenty of my patients would do it. I think I am right in this line of work. That is the best way to prove it.

Dr. Chupein brings this as a representative case [referring to model], but if my experience is worth anything, and if contour work is worth anything, then I beg to disagree with him; for if it is a representative case showing the possibility of saving teeth, it won't do it. The approximal surfaces of the bicuspids are safe, but the distal surface of the second bicuspid would go in spite of all efforts.

Dr. James Truman.—This discussion reminds me of one fact,—that all things move in circles, for I believe that these subjects come up regularly every one or two years.

I have been pleased to find that quite a number have defended Dr. Chupein, for I feared at one time that he was doomed to be in the minority of one or two; forty years ago he would have been in the majority. At that time nearly all the sixth-year molars

were extracted. They were condemned with undue haste and without proper consideration.

'I remember twenty years ago of having had a discussion on this very topic with my colleague and friend, Dr. Barker. The discussion grew very warm. He said to me, during the meeting, that he would bring two children with him the next day, and he would convince me that the extraction of the sixth-year molar was the proper thing to do. He brought his two children, and they were examined by others as well as myself. Beautiful sets of teeth they were, but in each of them the sixth-year molar had been removed, as he had stated. I then told him that if I lived to be old enough to see these children when grown up, that they would exhibit spaces between all these teeth anterior to the sixth-year molar. He regarded the statement with incredulity. I have never seen them from that time to this, but a friend of mine who has operated for the family since the father's death assures me that the spaces are there.

What is the position of this sixth-year molar? It occupies a place in the series more important than any of the posterior teeth. It is the key of the entire arch. The direction of the anterior teeth is towards the median line. This inclination is essential to perfect articulation. The removal of any of the teeth changes this position to the direct vertical, and the disturbance will be in proportion to the size of the tooth. The removal of this first molar utterly destroys perfect articulation and makes spaces difficult or impossible to remedy.

Now, what is the sixth-year molar, that it should be condemned? It is not, of course, as dense at the age of six years as the twelfth-year molar is when it comes in; but it is demonstrable that every tooth increases in density as the years go by, and the tooth becomes more resistant to caries each added year.

I do not see how our friend Dr. Chupein can take, at this advanced period, the position he has to-night. It seems to me to be retrograding to that period I alluded to; but I think the profession has arrived at a time of increased intelligence in regard to the salvation of the teeth than would seem to be the case by the paper that has been read this evening. We are here to save teeth; that is our business, and we are not extractors of teeth, whether these be the sixth-year molars or others in the series. We must save them to the very last root, if possible.

Dr. Chupein.—It is not the object of my paper to recommend the extraction of all sixth-year molars, but only to take it in the

condition that we find it and extract them when we think it is necessary. I have very frequently in my practice saved all the teeth that came to me.

I know of some families that have been sent to me, and, after giving the attention required, I have not seen them for a long time, and have wondered whether they were dissatisfied with my treatment and have gone elsewhere; but eventually some of these parties would return, and examination would show that other teeth had been extracted. I knew that I had not removed these, and I came to the conclusion that their teeth were in better condition with the teeth that had been extracted than if they had remained with me and I had attempted to save them; so that I cannot be classified as an extractor of teeth.

So far as the spaces that are referred to by Dr. Kirk are concerned, I do not think that I have observed that the gums were ever inflamed by the spaces left between the teeth, such as represented on that side of the model. [Indicating.] I do not mean to say that teeth cannot be plugged and replugged again and again; but then I think we owe some consideration to the patients that come to us, and should try to save them as much pain as we can. I consider it good practice to extract this tooth at certain times.

Dr. Truman.—We all owe Dr. Chupein thanks for bringing this paper before us for discussion.

THE regular monthly meeting of this Society was held April 4, 1891. In the absence of the essayist for the evening, various practical suggestions were offered and considered by the members present.

Dr. Bassett.—It may be remembered that a few months ago Dr. Bonwill had a cast presented of a case in which the temporary superior lateral was missing. It was interesting as being very rare. I saw a case the other day, and have a model of it, in which both superior laterals failed to erupt. I have brought the model here. It was a novelty to me, but I do not know how much it may be to the other gentlemen; I had never seen a case before, and thought it might be interesting to show it.

The case is that of a little girl about eight years of age. As shown, the sixth-year molars are erupted, but the other temporary teeth are not loosened.

By way of asking for information, I would like to know whether any of the gentlemen have had similar presentations, and whether such are common or not. We frequently see cases where one or both of the superior laterals of the permanent set are missing, but I never before saw one where they were missing in the temporary set.

Dr. Truman.—I have seen cases exactly like it. It is rarely we have irregularity in the deciduous teeth. I presume the teeth are developed properly in the jaw.

Dr. Deane.—You think those deciduous teeth would be forced out later on in life?

Dr. Truman.—I should think so, when the permanent series come.

Dr. Rehfuss—A short time ago I saw a case where two inferior centrals were united. The peculiarity about it was that they were exactly similar. They could not have been put together closer than they were. They were exactly mates. It was not my case, but that of Dr. Robinson. They looked like ivory. It was a beautiful specimen of temporary teeth. I do not suppose that it was exactly a novelty, but the position of the teeth being so regular made it a particularly interesting specimen.

Dr. Truman.—I suppose Dr. Rehfuss means the union of the teeth. I think most of the members here have seen cases of that kind; at least I have, quite a number of them,—deciduous teeth united in that way and also permanent teeth. I do not regard that as a very extraordinary thing, although it is not common. A great

many persons may go through many years of practice and see nothing of the kind. Clinical work in colleges will show more than private practice.

Dr. Bonwill.—All I have to say in regard to this is merely to give my experience with two cases I have had after thirty-six years in practice; they both came in the same year. One where both laterals were absent, and one case where the right superior lateral was missing, and in the other the left superior lateral was not in place. I am watching this case with a great deal of interest. I suppose there will never be any permanent laterals in their place. It is rather singular that I should never meet with anything of that kind in thirty-six years, and both came about the same time,—the same week.

Dr. Guilford.—How old is this child?

Answer.—About eight years.

Dr. Long exhibited an artificial tooth with a metal pin. I think it is a great improvement on any of the others. On account of having a screw cut in the body of the tooth, you can file your post any shape you want to suit, and then take out your post and grind the tooth to fit the root; and you are not troubled with the post in the way; then put a little cement on the post and screw it in the tooth, and after the cement hardens you can place the tooth in position.

Question.—Is this the old-fashioned pivot-tooth?

Answer.—There is a screw cut in the tooth that the pin fits in. I think the advantage is in taking out the post and grinding the tooth to fit. They are made by Johnson & Lund. The thread is made when the tooth is moulded and biscuited, and then it is baked. When it is in the mould, the pin is screwed out, I suppose. It could not be baked in the mould.

Dr. Rehfuss.—That is the way it is done. I saw the specifications of the patent. They biscuit it and then bake it afterwards.

Dr. Long.—I present for examination some very fine thin steel for matrices. It comes from Johnson & Lund. They will sell any quantity, large or small. Ordinary shears will cut it.

Dr. Guilford spoke of shears gotten up by the S. S. White Company for cutting hard substances, and recommended them to the members present.

Dr. Long.—I use a pair of shears which I bought in a ten-cent store for cutting emery-cloth. The action is as satisfactory as a high-priced pair, and I would recommend them to any one who does not wish to spoil a good pair in such work.

Dr. Guilford.—I did not think of saying anything to-night until I was on my way here, and then it occurred to me that there was one subject that has concerned all of us for a long while, and yet one in which many of us have not been sufficiently interested. It is the erosion of the teeth. I do not mean the erosion that we generally call by that name, where the surfaces are polished and smooth. I mean that resulting from any cause whatever. You know from your own observation the bad effect of certain medicines upon the teeth. To avoid this, physicians have been in the habit of telling their patients to take certain medicines through a tube, but a person cannot put a tube in the mouth and pour liquids down the throat, as we would into a barrel through a funnel. The liquids have to be taken into the mouth, carried to the back part, then thrown forward against the teeth and again backward, before they can enter the stomach. The physicians have been blamed for doing a great deal of damage to the teeth by the administration of certain medicaments, but we cannot place all of the responsibility upon them. We find cases of erosion where the cause is so obscure that we cannot definitely trace it. We sometimes attribute it to the taking of phosphates, or of vegetable acids in the form of fruit, or to the action of acids formed in the oral cavity, assisted, perhaps, by the low order of vitality of the teeth at the time. For my own part, I have felt for a long while that the phosphates that are so freely used to-day are responsible for much injury to the teeth. I had a case not very long ago which seemed to confirm this theory very markedly. A friend of mine, who is a druggist in one of the suburbs of the city, has a small business and sells soda-water. I have had the care of his teeth for many years. His teeth are of good average quality, and so are the teeth of all his family. His health has been good all along; no change in his system that I know of. I saw his teeth two years ago, and they were then in fair condition. I saw him a few months ago, and I was very much shocked at their appearance. Two crowns were entirely destroyed, while others were badly eroded. On the approximal surfaces most of those in the anterior part of the mouth were entirely denuded of enamel, while on their labial surfaces the enamel was entirely gone from the upper half. I questioned him as to what he had been doing. I asked him if he had ever used phosphates. He told me that last summer he had used them almost exclusively for his beverage. He took what is called phosphate-soda. He had drunk a great deal of it. There is nothing else in his case that I could attribute that particular erosion to. I had another case showing the effect of other acids on the teeth of a lady who has been

a patient of mine for a great many years. She came to me last spring, and her teeth were in good condition. Recently she called, saying that her superior anterior teeth were very tender at times. I looked them all over carefully, but there was not a cavity; the teeth seemed to have a natural appearance in every way. I finally took a napkin and wiped off the labial surfaces of the incisors. I noticed that when they were dry they had a crystallized appearance. Wherever the napkin touched the teeth they were exceedingly painful, while the touch of an instrument caused still greater suffering. There was so little wasting of the enamel that when the teeth were wet it did not show at all, as they retained their general form. I inquired into her case very closely, and finally ascertained that she had lived almost entirely on grapes during the past summer. We have seen the deleterious effect upon the teeth of grapes eaten in great quantities, especially in patients who have taken the grape-cure in Europe. Dr. Dixon mentioned to me the case of a young lady whom he had seen in the spring. She went to Europe, took the grape-cure, and came back in the fall with her teeth entirely honey-combed. In the case of my patient, I could attribute the harm done to no other cause but the acid of the grapes. I gave her proper directions, told her not to eat any more grapes, and prescribed the free use of prepared chalk around the necks of the teeth, especially before retiring.

The other case I had came to me a few days ago. It was that of a minister in this city, who is not only a close student, but has been very hard at work recently building a church. He is abstemious, does not smoke, and lives a regular and even life. His teeth were being eroded very much, as the druggist's had been. I inquired into his case, and could find nothing except that for a couple of years past he had been eating shaddocks for breakfast every morning. We know the acid taste of this fruit, especially in the early spring. They are picked in a green state, and allowed to ripen on the way. I could attribute his difficulty to no other cause than that of eating this fruit. It seems to me that in all these cases the trouble was traceable to acids in some form.

There was another thing that attracted my attention. The erosion was confined to the right side. The centrals, laterals, and cuspids were particularly affected; the left were not so much, and it puzzled me to know why. It was not, of course, from any action of the brush, because he is a right-handed man, and it would show more on the left side if caused by mechanical action. I questioned him, and he said that for the last six months or more he had been

eating upon the right side of his mouth, using the spoon in his right hand, and it probably came more in contact with the teeth on the right side than on the left. That seemed to me to be the reason why they were affected more on one side than on the other.

We have all been interested in this matter, and it seems to me that in all cases of this character we ought to try to get down to the facts, and find out, as nearly as we can, what has caused the harm, and some day we may be able to arrive at a reasonable conclusion in regard to it.

I should have mentioned another fact, and that is, so far as I know, we have never noticed any ill effects from eating grapes, except where the seeds are taken out. People who swallow the entire grape, without breaking the capsule in which the seeds are contained, suffer no injury to the teeth, but when the capsule is broken, the acid is liberated, and it is this that I believe to be the agent of harm in the matter.

Dr. Deane.—I would like to ask what the treatment would be in cases where the erosion is so marked.

Dr. Guilford.—I should try to get rid of the sensitiveness, and would forbid them using the article of diet suspected of being the cause. I said to the minister, continue your diet just as it has been, but stop eating shaddocks, and let me know in a month or so whether there is any improvement. In the second place, I recommend something to counteract the acid, generally precipitated chalk applied just before retiring.

I would like to ask if Dr. Truman noticed any effect of mineral waters upon the teeth when abroad.

Dr. Truman.—Not particularly. In regard to mineral waters, there is a great difference. Some are more or less acid; others are neutral; others are alkaline. I made some experiments in regard to that matter, and the rapidity with which the neutral mineral waters changed to acid, producing rapid development of micro-organisms out of the mouth, would indicate the probable effect on the teeth.

Dr. Woodward.—I have a very marked case of erosion, which I have observed for several years. The enamel and dentine appear to melt away from the gutta-percha, as well as from the amalgam and gold. The patient is in the habit of using acids for long periods to control the action of his liver, and maintains that this cannot be avoided. His teeth are almost destroyed. I think the erosion is caused by the acid, the dentifrice, and the brush. The acid condition softens the surface of the teeth slightly, which yields readily to the brush

and polishing material. In ordinary cases the precipitated chalk will relieve the sensitiveness, especially if used liberally at night.

Dr. Deane.—Dr. Woodward brings my own case in mind. I am troubled with slow, sluggish action of the liver. I have to take a great deal of muriatic acid, and take it very strong. I take sometimes as high as twenty or twenty-five drops. I have not, as yet, felt any discomfort of the teeth, but I would like very well to find some substitute for the acid, as I am becoming uneasy as to the possible effect.

Dr. Guilford.—In Dr. Deane's case, I would say that the general condition of the system has something to do with the effect of acids upon the teeth. I have no doubt that many of us take as much acid as the minister did. He was in a run-down condition at the time; so much so, that it acted as a predisposition in his case. The lady I spoke of was also in a debilitated condition. I suppose that many of us are at times subjected to similar influences, but, owing to other conditions, we are not affected in the same manner. I do not think their teeth were especially affected because they had used more acids than others, but because of the then low condition of their systems. I have not paid any attention to temperament, only to the fact that they were overworked or overtaxed.

Dr. Truman.—I cannot quite agree with Dr. Guilford in the idea that temporary systemic conditions make the teeth more liable to destruction. I cannot see why that should be the case. The teeth remain unchanged, no matter what the general conditions of the organism may be. Therefore, whatever takes place must necessarily be external to the teeth, and not through any special and temporary loss of vitality.

In regard to the general subject of erosion, there is probably much yet to be learned. I have given my views frequently in the dental periodicals, and very recently in the International Dental Journal, in the report of the New Jersey State Society, in which I went over the ground thoroughly, so that I have very little to offer in regard to it; but Dr. Guilford has brought up some points that were not then discussed, and to my mind they are quite important. This whole acid question—fruit acid—has not been sufficiently considered, for the reason, it seems to me, that dentists do not take a proper view of it. This subject of erosion by fruit acid has always been a matter of very great interest to me. I presume every one here will bear out the assertion I am about to make, that patients are more troublesome in the spring of the year, at the time we have our strawberry crop, than at any other period. I find that the acid

of the strawberry known as the Wilson Seedling is very acid, and it brings about almost invariably a troublesome condition of the teeth, the sensitiveness being greatly increased.

The acid of lemons and fruits of similar character, I am inclined to think, is more destructive to teeth than any that our patients are in the habit of using. It is a very common thing for some persons to puncture lemons and take the juice directly into the mouth. Some persons like it, but I cannot witness it without a shudder.

The acid of lemons will destroy teeth in a very few weeks. I had an excellent illustration of that fact. In crossing the ocean, a member of my family, against my advice, made use of lemons to overcome sea-sickness. The teeth were all right when we left home, and in three weeks' time they exhibited marked signs of erosion on the surfaces of the anterior teeth. I have noticed this occurring constantly in the use of fruits of this character.

With regard to acid remedies much in use, I agree with Dr. Guilford. These phosphates are destroying teeth by the hundred. There is no question about it. The sooner the dental profession protests, the better. I think it is our duty to warn our patients.

I had a patient, a few years ago, that caused me the greatest possible trouble. She was suffering constantly with toothache. I examined the mouth over and over again. I gave her antacid washes, but the relief was only temporary. I could not discover the cause. I said to her, finally, "You are habitually in the use of some agent that is antagonizing my efforts." She did not know that she was. I finally pushed my inquiries to the tooth-powder she was using. Her answer was that she employed a powder recommended by a physician. She brought me some of it, and I went over the ingredients. I said, "Do you use tartaric acid in that powder?" "Oh, yes," she replied; "I was advised to use a little of it." The cause being discovered, the remedy was simple; the teeth yielded to treatment at once, and the cavities were filled properly.

Then there is the action of different mineral acids. I am surprised that our friend here, Dr. Deane, will use these in the way he does, and, though he may not feel any trouble now, he is bound to have it before long. Several years ago I had a patient employed in a confectionery establishment. Of course the confectioner's sweet always means an acid resulting. The destruction was almost universal and the sensitiveness beyond endurance. Before operating at all, I placed her under the effect of a daily wash of a solution of bicarbonate of soda; the result was very gratifying, and at the end of a week I was able to operate with comfort to her and myself.

I had another patient who was a worker in a chemical laboratory. She had beautiful teeth,—one of the most beautiful sets I think I ever saw for regularity and for density, which is to the dentist much more satisfactory than white teeth. She was not in the acid department, but still was so constantly affected by the atmosphere that it was impossible to save her teeth for any length of time. I finally advised her that, unless she could change her business, it would be impossible to save them.

On the whole, the matter of erosion I regard as altogether a chemical one; and to me it is immaterial whether it be the anterior or labial surfaces of the teeth that are worn away. It is unquestionably always due to the acid condition, and I do not, as I have stated in other papers and discussions, separate abrasion from erosion. Abrasion may be by simple attrition of one tooth upon another, and that attrition always advances, in my opinion, by an acid condition.

I had a very fine illustration of this some years ago. A prominent clergyman desired a tooth regulated. He had a beautiful set of teeth. The incisors were magnificent specimens. I placed on the regulating apparatus, and he did not appear for some time, to my annoyance. In about a month he returned, with the central incisor worn down a quarter of an inch from the cutting surface. I asked him what he had been doing to cause this disturbance. He replied, nothing. But I answered, "This single incisor could not have lost so much of its grinding surface without some irregular action." He then told me that the teeth annoyed him, and he had been biting the lower teeth against the central incisors. The abrasion was evident; but all the biting possible could not have worn it down to that extent in the course of four weeks without the aid of acid secretions. It was evident that the change produced at night from the neutral day secretion had worn down the tooth by the acid produced, and attrition had done the balance.

You know how rapidly the teeth of those who grind the teeth at night disappear on the cutting edge; how soon they are reduced to almost stumps. It is not the grinding solely, in my judgment, but a combination of acid and wear. I have always secured an acid reaction in mouths tested at night, though neutral in the daytime. If this be the case, we can understand erosion. As I said at the New Jersey State Society, I do not regard this action of erosion as a difficult problem; it is one of simple things; and if we look at it in the right light, always taking the acid view of the question from the beginning, it will lead us up to clear conclusions in regard to results.

Dr. Tees.—I find in my own practice among my regular patients who obey my instructions in the use of prepared chalk once or twice daily that they have no evil results from the use of acids. They may use fruit of any kind, lemons or anything else. In fact, in some cases I recommend the application of lemon juice around the gum. The most efficient antacid that I know of is prepared chalk.

I think the cases described by Dr. Guilford are exceptions. I do not suppose he meets on the average more than two or three a year, and I have no doubt such are in the mouths of those who never use the tooth-brush. I furnish prepared chalk to patients in half-pound packages, that they may have plenty of it. I have no doubt the use of it is a great benefit. No doubt we have all noticed how quickly the mouth responds to treatment when this is ordered. After the use of such preparations, the painful effect ceases, and we are able to operate with some degree of comfort.

Dr. Chupein.—I should like to ask Dr. Truman how he accounts for the highly polished condition of the erosion, if, as he says, it is due to chemical action.

Dr. Truman.—I will ask the gentleman to go back many years with me. Possibly he remembers the old clamps or clasps of some thirty years ago that used to be attached to the teeth. They were made of half-round wire, and to these were attached perhaps two or three teeth, and the invariable result of that was the wearing away of the teeth they were attached to, precisely as we see the erosion at the present time, and highly polished. I presume he will agree with me when I say that I have seen them cut half-way through the teeth. The irritation which was aroused by that half-round wire produced secondary depositions in the pulp, and the result was that the wire would go through the tooth without producing pain. Now, how was that effected? How was the polish produced? It was by the constant movement of the clasp and the movement of the secretions. You cannot get a polish by merely chemical action. You do not find any polish in teeth of a soft character where the acid acts with great rapidity. It is only in dense teeth. Secondly, this erosion occurs at middle life, when the teeth have nearly reached the maximum of density. This is my experience.

How do I account for the polish on the front teeth? There is a constant motion there of the muscles of the lip. In talking, of course, there is always motion of the teeth and lips. Then there is a constant flowing in and out of the secretions and the food con-

stantly pressing on these surfaces. The tooth-brush may be a factor also, but it seems to me not a powerful one.

I hold that the polish is simply produced in that way, and I see no reason for any other explanation. I know it is a difficult thing to test, and we are obliged to reason from analogy, hence I brought up the clasp as an illustration, because I know Dr. Chupein and others here as old as myself remember the condition of things as a result of its use.

Dr. Tees.—Dr. Truman stated that cases of erosion were nearly always at middle life. I have seen a great many in the twenties. Erosion where a great deal of the tooth substance is worn away. The polish was there also.

Dr. Truman.—You may have dense teeth at twenty years of age. It is always confined to dense teeth.

Dr. Chupein.—I have never noticed the conditions except in middle life in very dense teeth.

Dr. Tees.—I had a patient to-day with two very distinct small cavities on the labial surfaces of the superior right canine and superior right lateral, a sixteenth of an inch deep, and probably the width of a small pin-head. I would like Dr. Truman to give his opinion of these two cavities. They were on the labial surfaces of the superior right canine and superior right lateral, two distinct deep cavities. The rest of the enamel was perfect. Now, what could have caused this?

Dr. Truman.—These were ordinary cavities?

Dr. Tees.—Yes; but why should those little, distinct cavities be there? Why should not the whole surface there have decayed? It has been within a year that the cavities have formed.

Dr. Truman.—The only explanation is that they always begin at a small point. There is one portion of the tooth which comes nearer the lip than any other point, and, as Dr. Kirk has demonstrated the glands of the lip to be always acid, it will then be understood why it would begin at a particular part on that surface.

Dr. Tees.—Dr. Flagg has done what Dr. Truman gives Dr. Kirk credit for.

Dr. Truman.—I must take exception to that. No one, as far as I am aware, has demonstrated facts as Dr. Kirk presented them. We know very well, in a general way, that the mucous glands are considered to exude an acid secretion; but you cannot always get an acid reaction from other portions of the mouth. Dr. Kirk was induced to make these experiments by the facts which I gave in regard to the secretions at night being powerful and more destruc-

tive at that time than during the day or active period. I took the position that the upper lip held the secretions against the teeth, and fermentation took place. Now, Dr. Kirk's demonstration was to prove that they were acid during the whole twenty-four hours, and he went into a series of very delicate examinations to demonstrate that fact. I do not know that it ever was done before. I therefore give him the credit.

Dr. Tees.—Dr. Flagg said that the mucous secretions of the mouth were acid. If the whole mucous secretions of the mouth are acid, of course the lips ought to be also; and he also explained that in a healthy condition of the mouth the secretions of the salivary glands were alkaline, and that the secretions of the mucous membranes, being acid, neutralized each other.

Dr. Guilford.—In regard to the matter of erosion, I have seen many varieties of it; the most common one, of course, being that of the disappearance of the enamel. I have seen it between the teeth and not upon the labial surfaces. I have also seen it in a sort of worm-shape distribution around the incisors and palatine surfaces; but the most singular case was that of a young lady, twenty-five or thirty years of age, whom I was called in to see. The fillings, which had been put in a few years before, were all perfect, but the whole surfaces of the enamel had dissolved, just as though the teeth had been made of candy and had been dipped in water several times. All of the fillings stood slightly above the surrounding tooth tissue. It was the only case of the kind that I have ever seen.

Subject passed.

Dr. Deane.—I have the subject here of statistics of manufacturers. I would like to ask for some instructions. It seems the agent is canvassing the matter in a new way. It seems to me the statistics would be of benefit to dentists. The agent has called on me and explained it so that it seems not to lessen professional dignity to fill out these blanks. I would like to know whether the Society objects to a member making the desired record. I have been asked this question by several members.

Dr. Guilford.—I think the agents have been asking too much. Certainly what they did ask for seemed to be obnoxious to those who were approached.

Dr. Deane.—This agent simply requires the number of plates that you have made for the year 1889, not bridge- or crown-work, or anything of that kind, as to the quantity of plates and how much they were worth, not individually but collectively. If you do not manufacture plates they do not want to know anything about it.

Dr. Guilford.—The Baltimore dentists were up in arms about it. They considered it inquisitorial. They would not give the facts wanted.

Dr. Tees.—I move that the resolution on the books be reconsidered.

Dr. Rehfuss.—I should be thoroughly opposed to rescinding this resolution. First, because this Society and the dentists of Baltimore have taken a stand in showing their position to the dental profession. The government has made a mistake in issuing this form,—that they acknowledge,—and this blank is a modification of the blank presented before. It has not the slightest thing in it in regard to the separation of mechanical from operative dentists. I do not think the plan would give correct statistics. I think the Society should allow the resolution to stand.

Dr. Deane.—I cannot quite agree with Dr. Rehfuss. I think he overlooked the point that, if it is possible to find out how many plates are made once in ten years, it would be of great value to the dentists, and that is all they ask for. They do not require you to say anything about your fillings, nor anything about the number of operations, but merely the number of plates manufactured; and they want to know, once in a stated period, how many plates are manufactured in the United States, and how much money was put into it. It seems to me that in thirty or forty years from now the statistics will be of great value to dentists.

Dr. Truman.—I think this Society or some other Society ought to take action to get the tariff taken off English teeth. It is impossible to get English teeth now without a great deal of trouble. The tariff was raised from 20 to 55 per cent. ad valorem.

Dr. Guilford.—I think I saw a statement of some one in the West who said that there was a mistake, and that they ought to have been rated under the name of manufactured articles, and not porcelain.

Dr. Truman.—I sent to Washington to our representative to get the facts, and he sent me a work covering everything. It gives a list of the old terms, and then says, "Refer to porcelain." Referring to porcelain, it has nothing to say with regard to teeth, but states that all porcelain not ornamented shall be at the rate of 55 per cent. ad valorem. If an attempt be made to import teeth, it will be found that the duty will be 55 per cent., and that is practically prohibitory.

At the regular monthly meeting of the Odontological Society of Pennsylvania, held November 14, 1891, the president, Dr. Louis Jack, introduced the essayist of the evening, Dr. Rodrigues Ottolengui, of New York, who read his paper entitled, "A Study in the Regulation of Teeth."

A STUDY IN THE REGULATION OF TEETH.

BY RODRIGUES OTTOLENGUI, M.D.S., NEW YORK.

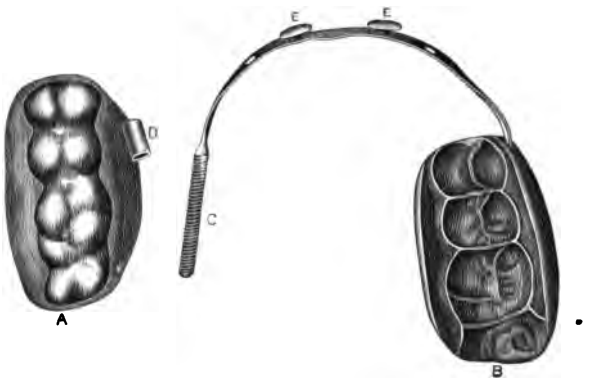
Mr. President and Gentlemen,—Let us consider the position of a young graduate when the first case requiring regulation is presented to him. With no previous practical experience, can he rely upon the directions offered by text-books, and, by following them, feel assured of success? Unhesitatingly, I say, No! It is my object in this paper to show wherein the descriptions of cases in published reports are inadequate to guide the non-expert.

It has been the custom of writers first to consider etiology. This is science, and therefore admirable from that stand-point, but only in a few instances does it assist the practitioner who is about to undertake a case. For instance, if it can be determined that a given disfigurement is hereditary, it is at once indicated that the retaining-plate must be worn for a long time. But the teeth must be regulated first, before a retainer is even to be considered.

Next, we find the author giving a general description of methods, all of which is invaluable, but does not yet indicate the specific plan best adaptable to the case in hand. Lastly, we come to cases from practice. This is the most valuable knowledge offered; but even this is inadequate, for we find the author explaining how he accomplished results, without giving in detail the obstacles which occurred unexpectedly, and how they were overcome by special apparatus invented by the ingenuity made requisite by the necessities of the condition.

Notwithstanding the fact that we have already so many text-books, I believe that there is room for one more, which shall be written as I mean to write this paper,—that is to say, after one or two very brief chapters upon generalities, and a reference to other works for the science of the subject, to proceed by a continuous history of numerous cases from practice, well illustrated, giving failures as well as successes, and placing in juxtaposition the ac-

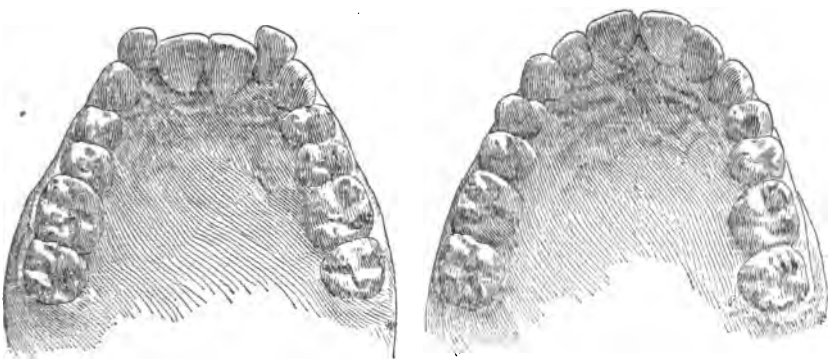
FIG. 1.



A represents the masticating surface of the movable shoe, showing gold facing.
D represents the inner surface of the fixed shoe.
C, the screw which fits into the screw cylinder *D*.
E shows the buttons to which the india-rubber bands are attached.

counts of cases apparently similar, which nevertheless demanded totally different methods.

Without further preamble I will describe the one case which I have brought with me, and which I have denominated a study. Last October a young woman, aged eighteen, came to me with her teeth as shown in the models. Just here let me say that the best set of models procurable are not always sufficient in diagnostication. This case is one of those where the study of models alone will not lead to the correct solution of the problem. Yet this was the very error into which I fell. Let us, then, consider the models a moment, and I will explain the deductions upon which I at first began work. At a casual glance it appears that only four teeth are involved in the irregularity. The superior central incisors are tipped inward, while the laterals project forward. This forward projection of the laterals is seen to be more apparent than real. Were the centrals in normal position, it would simply be one of a common class of cases where the anterior tips of the laterals slightly overlap the centrals. The occlusion with the lower jaw being good, my first study of this case went no further than this; and I determined to begin by bringing the central incisors outward, after which the laterals could be slightly drawn back, and



the case considered completed. To do this a very simple appliance was needed,—a vulcanite plate to cover the roof, held in place by clasps, and having a gold hook about opposite the sixth-year molar on each side. Such a plate in position, a rubber band could be caught over one hook, brought forward between the lateral and cuspid, then back between the lateral and central, forward again between the next central and the lateral, and backward around the

other lateral, being finally caught over the other hook. The tension would tend to draw in the laterals and throw out the centrals by one action. I made this plate before again seeing my patient, but I never used it. Why? Because further study showed that more was required in this case than the movement of four teeth. A closer scrutiny of the face showed that an otherwise comely countenance was really spoiled by a retreating chin, which was apparently augmented by the protrusion of the upper lip. This made a total change of plan expedient. In the first instance the alteration was to have been accomplished by considerable forward movement of the central incisors, and only a slight retreating of the laterals. By this plan I would have made no change in the upper lip, but rather the contrary, since I should have sent outward two more teeth to support it. If I wished to lessen the protrusion of the upper lip, it became necessary that the greatest movement should be in the lateral incisors which should be moved backward, and the centrals brought forward only far enough to give them a more erect position. As to the retreating chin, that fact made an entirely new plan possible. It will be seen that in carrying the centrals forward, as first decided, there would then occur sufficient space for retreating the laterals. But if I were to undertake to bring the laterals backward first, there would be no room whatever for its accomplishment, all the teeth being present and closely contiguous. Space for this could be procured in either of two ways,—by extraction, a method reluctantly to be resolved upon, or by expansion of the arch. In this instance the occlusion would thus be destroyed, and sufficient expansion would leave the entire upper jaw, after regulation, biting outside of the lower, a sufficient cause, ordinarily, for not choosing it, submitting in preference to the loss of two teeth. With the disfigurement of a retreating chin, however, the case assumed a different aspect, for, after regulation of the superior jaw, the process known as jumping the bite would not only alter this defect in beauty but would restore a good occlusion. For these reasons the first method was abandoned, and widening of the arch was decided upon as a preliminary step.

Now, were I to follow the custom of authors, I could say here simply, a plate was made, supplied with a jack-screw, and the jaw was widened in so many days. The kind of plate and the jack-screw itself being well known, it might appear that I had said all that was necessary. I have seen various devices for widening an arch pictured and described, but I have never seen the difficul-

ties of their application explained. Thus, when the young dentist confidently attempts to widen an arch with a jack-screw, he may be disgusted to find that he cannot do it. In my experience there have been very few cases where the jack-screw can be successfully used without special knowledge of how to overcome obstacles which will arise, or the ability to extricate one's self by ingenuity of invention. It may be advantageous, therefore, to say a few words about the jack-screw in connection with the plate.

Given a jaw not over fourteen years of age, in which the molars and bicuspids are well developed and of good size, standing in erect position so that their palatal sides are on parallel planes, the one side of the mouth with the other, and the widening of that jaw will be a pleasure. How often will such a condition be found in a mouth which is abnormal, since regulation is required? Any departure from these conditions adds to the difficulty of using the jack-screw and split-plate. The plate is made and allowed to cover the palatal surfaces of the posterior teeth for ever so slight a space, and what do we find? A plate which has a bevelled edge to it. As soon as the jack is tightened the tendency will be to throw the plate down towards the masticating surfaces of the teeth. The jaw cannot be widened with such a fixture. The remedy is to carefully trim away the plate till it meets the teeth, presenting a sharp edge. But suppose that after this is done it is still found that the plate is thrown down. The reason will be that the palatal surfaces of the teeth present slanted planes. One way to obviate the slipping is to make a new plate having spurs of gold to extend between the teeth so that they will catch under the knuckle.

I made what I deemed would be a suitable plate for this case. It was of black rubber, supplied with clasps, and well-fitted, the edges being sharp. When placed in the mouth and the screw tightened, it was very firm. The first result of using a jack-screw is always gratifying. The measurement with a compass will show considerable movement within one or two days. After that, progress is slower. This is because at first the teeth move in their sockets, as when separating for filling. After a week my patient complained very much of pain produced by the plate along the palatal wall. Examination showed that the gum tissue had been destroyed till the bone itself was in sight. This was deplorable, but how had it occurred? The patient being eighteen years old, the teeth were somewhat resistant, but the main cause was the fact that upon that side the teeth tipped slightly towards the palate, so that the tendency of the plate, under the pressure exerted by the

screw, was to slide up against the gum, thus making pressure against soft tissue, which, of course, yielded and was lost. This plate, therefore, it was necessary for me to abandon. I made a new one similar in every respect to the other, but in addition supplied with a means of preventing a recurrence of the disturbance. Taking a bit of gold wire and burning the ends till they balled up, I fashioned it so that it rested across the sulci of the first and second bicuspids. Another bit of wire soldered to this, forming a T, passed down and entered the vulcanite. Each side of the plate being supplied with a T, the arms of which rested in the sulci of the bicuspids, it is plain that the plate could not be forced upward against the soft tissue. This proved a successful scheme, and the jaw was widened without further difficulty.

Before the expansion was completed, a second plate was requisite, because the first one became too much straightened under the action of the screw. This second plate was exactly like the last described, except that in addition there was a gold hook opposite the molar upon each side. As some space had been obtained by the widening which had been accomplished by the first plate, it was decided, when making the second fixture, to begin the retraction of the laterals. The plate in position, an elastic band was stretched from each hook over the lateral upon its own side.

At the end of the sixth week the jaw had become as wide as was deemed necessary. A comparison of the models will show that the asymmetry has been marvellously well corrected. It is also noteworthy that this patient is a gifted singer under the tutelage of one of the finest masters in the metropolis. Her lessons were necessarily interfered with during the regulating, which caused a deep growl of disapproval from the professor. After the regulation was completed this growl was changed into a song of praise, for the teacher asserts now that the added tongue-room has given the lady a richer tone, a better pitch, a more extended scale, and more control of her notes. Before passing from this I would say that the widening here gained in six weeks may seem inadequate to the time expended. It must be remembered that the patient was eighteen years of age. With children of twelve to fourteen I have seen a greater gain in two weeks, and in one instance but six days was required to widen a jaw the width of half a molar, more than which is rarely required. In that case the suture opened.

Returning to the case under consideration, we now come to the point where the plates for widening the arch were to be abandoned. The new fixture required was a simple plate to cover the roof of

the mouth and fit accurately the palatal surfaces of the teeth. It was made stiff enough to resist the tendency of the jaw to resume its original form, and it was supplied with four hooks,—two opposite the molars as before, and two in the vicinity of the cuspids. A single rubber band was hooked to the posterior hooks and placed, as was intended in the first plate which I described and which was abandoned. To apply the band it was stretched across from hook to hook, and the plate placed in the mouth. Then a ligature was passed through one loop of the ligature, which was then brought forward till it rested over the four incisors. Next, the central part of the ligature was carried backward again and allowed to rest along the palatal surfaces of the centrals. The action would tend to force the centrals outward as well as bring in the laterals. But it was designed to reduce the laterals more, and therefore the other pair of hooks became necessary. A ligature was extended from each over the lateral on the opposite side of the mouth. With this the completion of the work was attained in two weeks more, making eight weeks in all the time spent upon the case up to this point.

The next step was to make a retainer, and the one made is seen upon one of the models. I have seen it stated by one author that a "cage" can be made of piano wire in fifteen to thirty minutes which will fit accurately. It is possible that we do not all mean the same thing when we say that a fixture fits. I wish to call attention to the "fit" of this appliance. The model shown was made from a plaster impression taken with the fixture in place. Before pouring, the gold appliance was placed in the impression, and you see the result. I have not attempted to separate it from the model, because the backings for the two centrals were made to extend under the gum, and therefore are tightly held in the plaster. Besides, were it removable from the model, there would occur an abrasion of the plaster teeth which would soon mar the appearance of fitting. It is noticeable that, while this cage is accurately adapted at certain points, there are one or two places where the band does not rest against the teeth; but this is only at points where absolute fit was not needed. A retainer of this kind is very cleanly, being removable, does not fill up the mouth, and can be made to hold teeth rigidly in almost any position, provided the teeth are long enough, or of such shape that it may be fashioned so that it will keep its place. I will explain how this is made, for there is nearly ten hours' work in the construction of such a piece, at least in my hands. First, to an accurate model made from a

plaster impression half round clasp-gold wire is bent into clasps for the molars and for the second bicuspids. These are perfected by fitting about the natural teeth, and made to bind the teeth near the gum-line. Impressions are taken with them in place, and models poured with plaster and sand. These models will present the clasps in desired relation to the teeth, and they are united with solder. This process is repeated, going to the mouth and taking new impressions as often as may be requisite till the cage is completed. Ordinarily there will be no need for a backing to any teeth such as I have for the centrals, a simple bearing of the band being sufficient. But while a band will restrain teeth which have been retracted, as it does the laterals in this case, it will often fail to control teeth which have been sent outward. This is because the palatal surface is an inclined plane, and the action of the tooth, in its tendency to return to its original position, will simply throw down the fixture. To make the backing, make an accurate model and then carve away the gum, exposing the bulb at the neck of the tooth, carving it into shape. Make dies and swage the piece of pure gold plate. This will give an approximate fit, and the purity of the gold allows of its being readily burnished to the natural tooth, so that it is a perfect adaptation, extending below the gum and reaching a point of anchorage under the bulbous portion. The cage is then placed in the mouth binding the backing to place, and an impression and models made as before. Solder then unites the piece and stiffens the backing at the same time.

A fixture of this kind could only serve temporarily in this case, because it was planned to jump the bite. For this reason it would not have been made, except that the young lady wished to return to her home in Kansas for the Christmas holidays. She remained away for a month, and upon her return I made a plate with which to accomplish the jumping of the bite. This was a black rubber plate fitting accurately the back of the centrals, so that it should retain them, and supplied with an inclined plane, over which the lower teeth would be forced to reach. The laterals were controlled by a band around the labial surfaces. This biter was worn for four months, a longer term than is usually necessary. The habit being formed, a retainer was made which spanned the arch, two hooks passing outward over the posterior corners of the laterals, which were made to hold these teeth in their retracted positions. The final models show the result.

The points of special interest in this case are,—

First. It is one of a numerous class of irregularities, in which

the best result is obtained after moving several teeth, notwithstanding the fact that the first study seems to show that but a few are involved in the irregularity.

Second. So simple a thing as the widening of the arch could only be attained by devising means of overcoming an unexpected difficulty in the abrasion of the soft tissue of the roof.

Third. So universal a retainer as the one shown could only serve a temporary purpose, because of the closeness of the occlusion.

Fourth. The unusual advisability of destroying a good occlusion and reconstructing it, because of the gain in facial symmetry and the advantages of voice-power obtained by slightly increased width of the arch. It is a question of some interest whether the improvement in singing was due to increase of tongue-room or to the improved curve of the arch.

Fifth. The length of time required to jump the bite, occasioned by the fact that either the age or the intense habit made the patient so reluctant that the inclined plane tended to throw the lower incisors outward rather than to alter the swing of the jaw. This spreading of the laterals made it necessary to abandon the inclined plane from time to time that the teeth might return to normal position.

Sixth. The beautiful result, which has repaid all the thought and work expended upon the case.

DISCUSSION.

Dr. Ottolengui, on concluding the reading of the paper, referred to drawings on the board explaining them, and said,—

Another instance where a special clamp had to be devised for moving with a jack-screw was where Dr. Kingsley was regulating a set of teeth in which in the beginning there was a temporary molar removed, and during the progress of the case the bicuspid came down into position practically within the arch, and interfered with the work that was being carried on to such an extent that it became expedient to stop moving that tooth into position; moreover, the teeth on the opposite side of the jaw were very short, and it would have been impossible to put a plate in there which would have had any bearing upon the tooth, because the palatal cusps were too short. In this case I devised an instrument that did the work. An impression on each side of the mouth was taken separately and models made. This is to be remembered that, however short the tooth is in appearance above the gum, the whole tooth is present in the jaw. Consequently, with the plaster model before

you, you can carve away the plaster till you have a fairly long tooth.

Now, around the bicuspid which was intended to be moved and around one on the opposite side I fitted bands made of pure gold burnished to the teeth. Then the two bands on one side were soldered together like the figure eight, and to that was fitted a little plate about three-quarters of an inch long and half an inch wide, which went over that part of the gum and was soldered to these bands, and on the plate was soldered a slot for one end of the jack-screw, and the band on the other side had soldered a little point for the reception of the jack-screw, and then the teeth were thrown out in about five days. So the jack-screw can only be used in extraordinary cases by some knowledge of obstacles and how to overcome them.

I wish to say one word about this other drawing (referring to board). I had intended bringing with me a set of models which were sent to me by another dentist.

They were evidently taken in some plastic material, and presented a drawn appearance around the teeth. He then had, seemingly, painted them with ordinary house paint and mounted them on an ordinary articulator, the plaster used to hold them being left as it was poured and white in color, and the whole thing was poorly made. He brought in the models and asked advice, which, of course, was refused without an opportunity to see the patient. Nothing could be told by these models, but when the patient came in I admit I was very much surprised to see what he had gained, because he had really made the jaw in six weeks quite presentable, and yet all the work he did was thrown away; and that is the reason why I wanted to notice the case.

This represents in a way (referring to board) what I wanted to demonstrate. The first glance would show that this tooth needs regulating, the tooth being within the arch, and in the six weeks he had made this tooth come into alignment, but an examination now of the jaw shows that the lower jaw closes imperfectly. The lateral incisor was nearer the correct position, and the other teeth should have been driven back instead of the upper incisor being driven out.

Dr. Kirk requested Dr. Ottolengui to go over again the line of reasoning which he adopted in the first part of his paper by which he determined whether he would widen the arch or move forward the central incisors.

Dr. Ottolengui.—That was a simple case. A close examination shows that not only are these teeth wrong, but at present the gen-

eral effect is that it is a symmetrical jaw. We expect a fairly curved line in the jaw, and if these models will be opened and looked at in that way you will see what a marvellous difference there is between it finished and its first appearance, as before it was a straight jaw, being a straight line on each side. The lower jaw is retracted in reality. The incisors turned up the lip in a way that made a very ugly appearance. (Illustrated by a drawing on the black-board, showing the sides of the upper lip protruding noticeably by reason of the projecting teeth.)

Of course it could have been retracted, I suppose, by taking out the teeth, but as long as we had arranged to jump the bite, it was advantageous to widen the jaw, because if you attempt this operation without doing this, you cannot get good occlusion.

Dr. Roberts inquired how long he was in correcting the irregularity from the time he started until he put the retaining appliances in place.

Dr. Ottolengui.—There were just six weeks used in widening the arch, I think two weeks for correcting the irregularity in the front of the mouth, and three or four months for jumping the bite.

I might mention in that connection a reason that would account for the length of time it required. I made a retaining plate for the patient, and the first one was very comfortable; but the span was too far back, and afterwards I took an impression and made a new plate which would do the work, and she came to the office without this, and it required four or five weeks to get the plate from her, because it was more comfortable, and she would wear it. Unless I could have secured that, I suppose the bite would never have been jumped.

Dr. Kirk.—I am very much interested in this subject. At present I have four cases of this type of irregularity on hand. Two of them have been completed and two are in process of regulating now, and the feature of widening the arch in relation to this form of irregularity is, I think, quite interesting. I have examined the models more closely since asking the question, and I find there has been a gain in width at the cuspid teeth of nearly one-eighth of an inch. I should have adopted the plan of moving outward the central incisors first, because it would not have occurred to me to widen the arch as a preliminary. The jump of the bite is quite an important feature of the case. The lower jaw was retracted and held in an abnormal position by the irregularity of the superior central incisors. As soon as released the lower jaw took its normal forward

position. The additional widening of the arch seems to have produced a more symmetrical form of the face than could have been had under any other method of treatment.

To my mind the apparent protrusion of the upper jaw was not an abnormal condition. In regard to moving outward the central incisors, the method described is quite ingenious and applies particularly to this case; but for four similar cases of my own I have adopted the plan, which I published some time ago, of using piano wire (indicates on the board), carrying the clasp around the molar, soldering on the outside of each clasp a little piece of gold tube, closing one end and leaving the other open, and then bending the piano wire to a U shape and letting it run into the tube sockets. These two clasps are united merely by a little silver plate which is used for the purpose of securing greater rigidity in the abutment.

I have used a modification of the same plan by putting tubing on the inside, with a slot cut in it and with buttons fastened on the free ends of the wire, carrying the wire inside of the arch, and tying the teeth to the spring thus formed on the palatal side for drawing in incisor teeth.

There is another plan which I have used for retracting teeth which is very satisfactory, and that is to swage a cap of thin platinum plate, about No. 31 or 33, over the teeth, slightly perforating the sides of the cap and cementing this on to the molars, and having a button or hook fastened on at the lingual or palatal part of the appliance. By such an arrangement you can use it satisfactorily with rubber bands for retracting the teeth. It is sometimes necessary to keep the teeth separated, and these caps open the bite sufficiently to allow that, and it is perfectly firm in its place. When I first used the cemented caps I found the cement did not adhere, but by making slight indentations around the edge of this swaged cap I was able to make it adhere nicely. These two methods have given me very satisfactory results.

Dr. Kirk, at the request of Dr. Ottolengui, described the proper way of tying a ligature to avoid slipping.

Dr. Roberts stated that he had used a modification of the appliance of Dr. Kirk, with the exception that, instead of piano wire, he had used half-round gold wire and cut a thread on either end. The nut comes up solid against the lug. Tie the band down to the tooth first and screw up the nuts. The patient can do it with a little wrench. Dr. Roberts had been very successful in that way. In conclusion he stated that he was very thankful to know the proper method of tying ligatures as had been so clearly illustrated by Dr. Kirk.

Dr. Guilford.—We all feel very much indebted to Dr. Ottolengui for coming over from New York and reading us his very interesting paper. I would like to agree with him in all he said, but am sorry to say I cannot. One of the cardinal principles in regulating the teeth is simplicity. The doctor has made a very fine operation, but it seems to me he has taken the longest and most difficult way of accomplishing it. By an examination of the models that we have I see no reason in the world why, in the one case where he extracted the first bicuspid, he could not have done exactly the same thing in another. By extracting the first bicuspid in the diagram (referring to black-board) he could have drawn the lateral and cuspid back. The models show that there is room after that, but by spreading the arch, throwing the central back, and bringing the lateral in and jumping the bite he has done a great deal of unnecessary work, according to my view. It seems to me the best way is to take out one or both of the bicuspids and draw back one of the anterior teeth; that could very easily have been done.

There is one other point in regard to widening the arch. It is an error that I think a great many practitioners fall into. The widening of the arch is sometimes necessary in one jaw and sometimes in both, but it is a very tedious operation and in many cases a very difficult one. If you expand the upper arch you have to expand both. Dr. Kingsley, one of our earliest and best writers, says that, after all, the great desideratum in regulating teeth is to have a perfect occlusion,—to have as many teeth brought into use as possible in the mastication of food. I find, on examining the models, that the occlusion between the upper and lower teeth, so far as the bicuspid and molar are concerned, is not good, and the bicuspid on the other side does not touch those on the lower more than one-third as much as it did in the beginning. So, I think, he has lost in the expansion of the jaw in that case, in the matter of occlusion. Wherever expansion of the arch can be avoided and occlusion is secured, I believe it is better to leave it so.

The other point is that we can often simplify a case by the extraction of one or two teeth and get the same results that we would get by a more round-about way. In the first case I should simply have taken out the first bicuspid, and then by putting metal bands around the second molar and cuspid tooth, with little hooks properly placed, and by the aid of rubber bands, the teeth could be drawn back one at a time with very little difficulty; then taking the bands off the cuspid and putting the same on the lateral, drawing it back in the same way. It can be done, if the patient is not

over seven years of age, in a comparatively short time. Pressing out the incisor tooth is also readily done, if needed, in a very simple manner.

I would like to take exception to some other things stated. He said that in taking the impressions for models he took them in plaster of Paris. There are some gentlemen who believe in plaster of Paris for all impressions. In going into the office of a dentist in this city, I was surprised to see on a table about five hundred pieces of plaster. He said he had been taking an impression of a case of irregularity. I have never had any difficulty in taking just as accurate an impression as I needed for cases of irregularity in modelling composition.

The essayist objects strongly to the use of the jack-screw. It can be abused,—there is no question about that. Where the patient is over twenty years of age, if we move a tooth too rapidly there is danger of devitalizing the pulp.

There is another point in regard to the rapid enlargement of the arch,—the danger of opening the suture where the two faces of the maxillary bones join each other. A friend of mine was exerting a great deal of pressure to expand the arch laterally; noticing that he was making unusual progress, he discovered that the sutures were opening, and he had to take off the appliance and let the case go for several months. The most powerful instrument we have for exerting pressure is the jack-screw. I use it wherever I can where great power is needed. Where less power is required I use the Coffin plate or metal springs, or something of that kind. When I want to work with rapidity, I cement platinum bands, with suitable lugs attached, to the teeth I wish to move, as well as those opposite them, and then exert pressure with the jack-screw. I see no objection to the proper use of the jack-screw. It is a very valuable instrument, and all it needs is to be used with care.

Dr. Deane asked Dr. Guilford if he did not think the bicuspids would regulate themselves, and that occlusion would be more perfect in a few years?

Dr. Guilford replied that he thought they would be better if they were farther back. I notice that one cusp in the upper jaw rests upon a corresponding cusp in the lower. Unless there is some pressure brought to throw that back, I don't see how it will ever take a proper position.

Dr. Ottolengui.—I think a great deal of the last speaker's criticism was due to the fact that he didn't hear all my paper or understand it. I certainly said nothing against the jack-screw, for I never

have widened a jaw with anything else, consequently it would be impossible for me to speak against it. What I did speak of was certain obstacles in the use of the jack-screw, but it can be used intelligently, and I endeavored to point out some of those features.

I am glad that the last question was asked in regard to the possibility of jaws changing. Dr. Guilford raised the point that he could not see how that would correct itself without pressure. The pressure is produced in mastication. It is one of the agreeable things that, however irregular the jaw may be, the occlusion is generally good, except in cases of extensive protrusion of one jaw or the other. The removal of one tooth will produce elongation of another tooth, until occlusion is reached. So it is the power of mastication which will remove these obstacles.

The doctor spoke of a case of widening where the effect required an abandonment for months. I spoke of one in my paper where the suture had opened. I have seen it in a number of cases, and I rather like it, and I have never seen any harm from it, neither has Dr. Kingsley in the extensive practice he has had. In the case I have spoken of, the lateral teeth were hidden behind the centrals and bicuspids with no room to pass through. The jaw was widened in the hope of getting room to send the lateral out. At the end of a week it was seen that separation was occurring between the central incisors, which indicated that the suture was opening. Examination along the median line with the finger showed that the suture had opened, and the pressure was continued until the amount of room desired was obtained. A fixture was then put in which would keep the jaw at the point widened and regular. The case was continued without any regard to the fact that the suture was opened, and in about three months new bone was deposited all along the line, and was held permanently in place.

Where the jaw widens without opening the suture, what may happen? The alveolar process is simply taken up. After wearing the plate for three months there will be a tendency for the process to return to its normal condition, whereas, if you open the suture and have a deposit of new bone between the separated portions, there is placed a permanent wedge there to keep the jaw from coming back.

A word about impression materials. I don't think it is ever necessary to break an impression into a thousand pieces. The more irregular the case, the more probability there is that the impression would break up, and the more necessity there is to take it in non-yielding material. It stands to reason that if the teeth, which

stand in the arch irregularly, and the hard plaster will not come out, the wax will not; but if the plaster will fracture, you can afterwards take the pieces and put them together, and you have an accurate model.

I want to say a word about extraction of the tooth in this case. I can't say there was really protrusion of the upper lip. There was protrusion opposite the lateral incisors, so that when the mouth was at rest you could observe a disfigurement over these.

The corners of the mouth were drawn in, and that was the reason I concluded to draw the laterals in. That action reduced the lip. The extraction of a tooth would be, in my opinion, a most deplorable thing, for it involves a greatly-increased space. We very seldom realize how much space a tooth will make until we take it out, or how much wider this looks than the tooth did when it was there, and therefore I think widening of the arch was permissible and advisable, because it allowed jumping of the bite; it gave a wider arch and a more symmetrical one, and, to a certain extent, it relieved the crowded condition you find on that side.

A word about screws. I had one of those very trying cases this summer where a bicuspid erupted without the arch. There was room enough for its reduction by a slight change of the other teeth, and after a space was made it was merely required to have an instrument to bring it into place. It is quite true nature may have accomplished this unassisted, but it had remained in that crowded position for a year and a half, and, therefore, it seemed advisable to force it into position. I made a plate, putting a couple of hooks on it, and threw an elastic band around the tooth, and brought it into position in one week. Now, what was the harm in taking my elastic band, instead of working with a screw? Every one who makes a practice of using springs or screws instead of rubber will admit, when he looks over his cases, that it takes, it may be, five months to do that which can be done by continuous pressure in half the time. What may be lost by possible danger to the tooth by moving it rapidly is more than counterbalanced by the comfort of the patient, and in causing the appliance to be worn not more than half the usual time. I think the nerves of the patient are to be considered as much as anything else. In the appliance of Dr. Kirk's I cannot see any special use of the connecting-plate. I had a case within a week in which I was in a quandary whether to make such an appliance or not, and I was satisfied that a single band was not suitable and it would not hold, and I made an arrangement similar to that described and fitted it to the mouth.

I asked Dr. Kingsley what I would gain by attaching them by a plate. He replied that he did not know; and neither do I. I don't see what can be gained. It only adds something for this clasp to do. The clasp would have to hold the plate up as well as itself. Where you can get two molars with anything like a knuckle on them, make a rubber wedge and fit that clasp to go to that point and keep them wedged until the appliance is placed, and as soon as it is pressed down you have a point that prevents that clasp from riding up. You can always force it up, because half-round wire is always wedge-shaped, and it won't slip.

Dr. Truman.—I appreciate the difficulty of discussing a case of this kind, when the patient is not present, to take into consideration all the features of it, but I do want to enter my protest against a practice I consider physiologically wrong in the regulation of teeth. I cannot understand how we can go on moving teeth continuously without general disturbance to the individual. I am thoroughly of the view that all regulation should be made intermittingly. Time should be allowed for the individual to recover from the nervous strain and for the formation of tissue. As Dr. Guilford has stated, I think, very truly, that there is a liability of the destruction or strangulation of the pulp, and there is increased danger in the irritation of the pericementum. Slight irritation is absolutely necessary, in my opinion, for the reformation of bone which must take place after the moving of the tooth to replace that carried away by absorption. Now, if you advance too rapidly, an inflammation is aroused which may end in the destruction of the tooth. Therefore I do not approve, as a rule, of bands or ligatures moving with a continuous pressure.

I would like, before the subject is closed, for Dr. Ottolengui to give his views on that point. It seems to me a very important one in the regulation of teeth.

Dr. Ottolengui.—If we can move the teeth with rapidity it does not seem to me physiologically wrong.

If any one else in the room was under the impression that I believed in risking the health of the patient by rapid movement of the teeth; I am very much pleased to have an opportunity of answering that question. As Dr. Truman very truly says, it is a physiological fact that there is danger in the too rapid motion of the teeth; but the question arises, What is a too rapid motion? If a tooth can be moved in eight weeks, it is more of an injury to take fifteen weeks to do it. It is important for a practitioner who is moving teeth to be able to appreciate when a tooth is being

moved too rapidly. I don't see that it is giving the patient rest with an appliance in the mouth that works slowly, but the entire stoppage of the pressure for a week or two weeks, when it is seen the teeth are moving too rapidly, is the kind of work which I prefer. It is, therefore, an advantage to make an appliance that the patient can put on or off himself.

Dr. Kirk.—A very interesting point has been raised by Dr. Guilford in connection with this case of Dr. Ottolengui's which I don't think has been sufficiently answered or discussed. It involves the principle on which the irregularity should be corrected. If the models show anything, they show in the first place malocclusion of the two jaws. The lower jaw occupies an abnormal position. It shows that the lower bite occupies at least the width of one tooth or half a tooth back of its normal place. Also that the cause of the malocclusion is the abnormal position of the superior central incisors. By the method Dr. Ottolengui has pursued he has brought the occlusion of the jaws back to their normal condition; he has done the very best that could have been done in that case, while if the irregularity had been treated as Dr. Guilford advocated,—viz., by the extraction of the bicuspid teeth,—he would not have restored the normal articulation which has so greatly improved the case treated by the method of Dr. Ottolengui.

Dr. Guilford spoke of a case of a little girl where the upper teeth protruded much. As the patient resided outside of the United States and could not remain here, some appliance had to be used that could be operated by her local dentist under instructions. After extracting the two first bicuspid teeth above, a Coffin plate was made covering the palate and all of the posterior teeth. On the buccal surface of this plate a half-round gold wire was embedded, passing around the arch and terminating in a threaded round wire. This engaged with a nut fitted into a slot in the rubber on the opposite side. The object was to draw the anterior teeth back,—six of them. In a few months the teeth were brought into proper position.

(The appliance was further described, and the doctor stated that the results were very satisfactory, although the work had been done by a local dentist and entirely by written instructions.)

Adjourned.

REGULAR monthly meeting of the Odontological Society of Pennsylvania, held December 12, 1891.

INCIDENTS OF PRACTICE.

Dr. Darby.—I have in this bottle an interesting growth which was recently removed from the mouth of a gentleman. Its position was the roof of the mouth, under a badly-fitting rubber plate. You will observe that it is an inch in length, seven-eighths of an inch in width, and more than a quarter of an inch in thickness. When the gentleman removed his plate preparatory to having some fillings inserted, I observed this growth, which resembled the hypertrophy of mucous membranes often seen where a badly-fitting plate, having a vacuum, is worn. A more careful examination revealed the fact that the mass was loose, and only attached to the surrounding tissue by a small pellicle not greater in diameter than a small quill.

Its removal was a simple matter, which was accomplished with a sharp bistoury. The hemorrhage which followed was profuse. I am sure I speak within bounds when I tell you that nearly a quart of blood was lost before the flow could be arrested.

Upon inquiry, I learned that he had worn a rubber plate for twenty years. This plate supported four incisors, and had bicuspids on either side. It had a large vacuum-chamber, and the superficial dimensions of the tumor corresponded with the shape of the chamber.

The peculiarities of the case are these: First, the enormous size which it had attained; second, the fact that it was loose and entirely detached except as above mentioned; and third, the healthy condition of the roof of the mouth immediately under the growth.

Dr. Gaskill said that he had had a similar case to that described by Dr. Darby, which he preferred to ligate in preference to excision. This was accomplished without the slightest hemorrhage. It covered a space fully equal to the diameter of a dime. It was tied with a silk ligature, and the portion removed was nearly a quarter of an inch thick.

Dr. Truman stated that he thought it was a case of non-malignant epithelioma, saying, "I have a case very similar,—a tumor that has been on the alveolar border for a number of years. I advised that it be let alone or else taken off with a ligature, which the patient objected to having done."

Dr. Peeso was then introduced, and read his paper on Crown- and Bridge-Work.

CROWN- AND BRIDGE-WORK.

BY FREDERIC A. PEESO, D.D.S.,[1] PHILADELPHIA.

THERE is probably no branch in the science of dentistry about which there exists a greater diversity of opinion than crown- and bridge-work, and there is certainly no one that has suffered more at the hands of unskilful and incompetent operators. Much has been written and said on this subject, both upholding and condemning it, and strong arguments have been adduced on both sides to prove either its great value or utter worthlessness.

A great many good dentists have been, and still are, strongly opposed to it, but this hostility is decreasing as the work and the methods pursued are becoming more thoroughly understood.

Crown- and bridge-work of the present time is very different from that of a few years ago, and as the people are becoming more enlightened on the subject, the demand for it is increasing, and the work becoming more thorough, and teeth and roots which but a short time since would have been condemned and extracted are now utilized as abutments for anchoring bridges and single crowns, and are giving a great deal more satisfaction than would have been the case had they been removed and plates substituted.

While some condemn the work altogether, others think that a single crown may be all right, or in some cases a very small bridge, but object to extensive pieces, claiming that they cannot stand, but will give way in a short time. If a single crown or a small piece of bridge-work will stand in the mouth, why will not a succession of crowns or an extensive piece stand as well, if the work be equally well done? If the work is used and not abused, it is one of the best things which can be done for our patients.

There is certainly nothing that can be done for them which will please them more, or give more lasting satisfaction, than a denture of this kind.

To most people the thought of wearing a plate is repugnant, but there will not be the same prejudice existing against crown- and bridge-work. It seems nearer to the natural teeth, and where the anchorage is sufficient it is more serviceable, and mastication is more thoroughly performed than it can be by the use of a plate.

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[1] Demonstrator of Crown- and Bridge-Work, University of Pennsylvania.

There are unquestionably many failures in the work, and so are there in plates, but as in the case of the latter, a large majority of these failures can be traced to causes which it is possible to remedy, or which if avoided at the beginning, would have made the piece successful.

There are many causes for failures in crown- and bridge-work, the most important of which are insufficient anchorage, improperly-trimmed teeth and roots, poorly-fitted caps and bands, short pins, poor articulation, perforated roots, etc.

The first of these causes to be considered is the anchorage. If this is not sufficient, of course the whole piece is a failure, let the work be never so well done. It is impossible to lay down any rules concerning this, but I will mention a few cases where a serviceable bridge might be placed.

In putting in a full denture it is necessary to have at least four good teeth or roots to serve as abutments. By some this is not thought to be sufficient, but if there are two canines, strong and firm, and two good, strong, solidly set molars, they will carry a bridge for a great many years, and I should not hesitate to place one in such a mouth.

In a case of this kind, the canines should be cut off and Richmond crowns used, and not half caps, as half caps are not suitable for permanent work. If the roots were diseased and could not be brought to a healthy condition, of course there should be no thought of using them. Where the incisors are lost and the canines are standing, often a lasting bridge may be placed, always supposing the teeth strong and healthy.

If the canines stand well apart, and the incisors can be placed nearly straight across the mouth, it will make a strong piece, but if the arch is narrow, and the incisors have to be placed on very much of a curve, it is running a great risk to trust to the canines alone to carry it, as the leverage would probably be so great as to loosen the teeth. Where the six anterior teeth are lost, it is well to give up all thought of a bridge and trust to a plate. In most cases a durable piece can be made running from the canine to the second molar, and sometimes even to the wisdom tooth. The two central incisor roots will carry the two laterals, and the lateral roots the centrals. A loose root does not necessarily preclude the idea of placing a crown. In a great many cases it will yield to treatment and become firm. I have not time to speak further on this subject, but will proceed to the preparation of the mouth.

After being certain that the anchorage is all right, the most im-

portant part remaining is the trimming of the teeth and roots. If this is not done properly the whole piece is unsatisfactory and may be considered a failure. I do not think I am in error in saying that in three cases out of four this part of the work is not done at all as it should be.

It will be found that just enough of the tooth has been cut away to allow the passing of the band between it and the adjoining teeth, or if the tooth has broken down so that the band can be passed over, it is not trimmed at all. The cap is put on, and when it is pressed to position the edges stand away from the root or neck of the tooth, cutting into the gum, and being a constant source of irritation, often causing inflammation and loosening of the tooth.

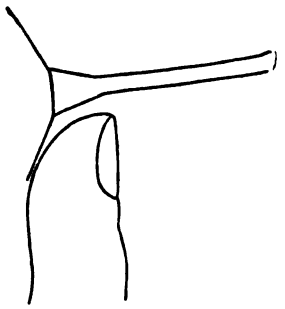
In trimming the teeth, the dentist should always have in mind what the shape of the tooth would be if cut across just below the margin of the gum. The swell should be entirely taken off to nearly one-sixteenth of an inch below the gum line, leaving the sides of the tooth parallel, or slightly larger at the neck, so that when the band is passed over it will hug the tooth closely and not impinge on the gum.

If you will take the trouble to trim a tooth out of the mouth, you will see that in shape it is very different from the majority of those you will see trimmed in the mouth.

Take, for instance, a lower first molar. Looking at it from the buccal side, the swell is very great; starting from just below the gum, it swells out, until where it touches the adjoining teeth it is often from one-quarter to one-third wider than at the neck. Looking from the anterior surface, the swell is not nearly so great, while the masticating surface is oblong. After this tooth has been properly shaped it will be nearly square, with the corners rounded, being slightly narrower at the distal side than at the mesial, owing to the distal root being smaller, and there will be about one-sixteenth of an inch between it and the adjoining teeth. (Fig. 2.) In many instances, after the mesial and distal surfaces are trimmed, it will be necessary to cut only the lingual, as the tooth often leans in towards the tongue, and after this side is cut away the band will pass over the enamel at the buccal side and touch the tooth below the gum. (Fig. 3.) It is often very difficult to trim these teeth on all sides with such wheels as you can get. Probably the most difficult place in the mouth to reach is the anterior surface of the lower molars. If you will take a thin mounted corundum disk and hold it over the spirit-lamp while the engine is running, and as the heat softens it a little press the edges outward, you will form a

cup-shaped disk which will do the work nicely. (Fig. 1.) For the lingual and buccal surfaces a small cup-shaped corundum will answer,—No. 11, S. S. White's corundums.

Fig. 1.



After an upper molar has been prepared, it will be found to be altogether different from the lower, being triangular in shape, with the base of the triangle at the buccal side and the apex at the palatal. (Fig. 4.) Of course this may vary at times, and the palatal root be as broad as the two buccal roots, but this is not often so. You will almost invariably find that this tooth has been trimmed about the same as a lower molar, without any regard to the shape of the roots, and that the band, while possibly fitting the tooth at the buccal side, is away from it at the palatal and impinges on the gum. In any of the posterior teeth it will be found that a great deal must be cut from the mesial and distal surfaces, but very little from the buccal and palatal or lingual. The cusps, too, should be ground away, especially where the tooth is to carry one end of a bridge, so as to allow a thick strong metal cusp to be placed on the band, and so form a strong attachment for the rest of the piece.

In making caps for any of these teeth, the band should hug the neck of the tooth tightly, and the contour should be restored till it

Figs. 2. 3. 4. 5. 6.

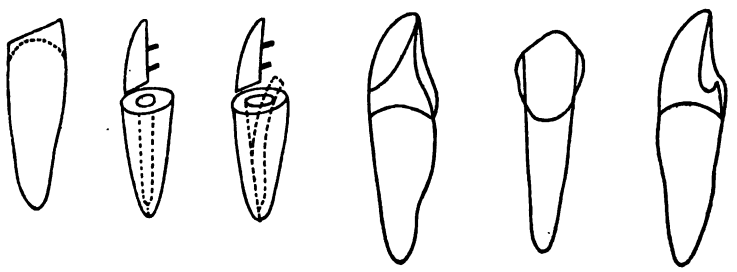
touches the adjoining teeth, so as to leave no space where the food may find lodgement and annoy the patient.

In preparing the teeth for Richmond crowns, the work is easier and more often properly formed, but here in a great many instances it will be found that the roots are not trimmed at all, or that the

work is not more than half done. After the tooth has been cut down to its proper level, if the enamel is taken off it will leave the root of the proper shape for the band to fit nicely, and it is very seldom that it will need any further trimming. (Figs. 5, 6, 7.) This will apply to any of the anterior teeth, or to any tooth where a Richmond crown is to be placed.

The preparation of the canal, too, has a great deal to do with the durability of the work. I think it is the general practice to enlarge the canal without changing its direction at all. In most teeth, if this is done, it does not leave room in front of the pin to place the porcelain without grinding it away or grinding the pin, and thus weakening it. (Fig. 8.) At times the pin is ground entirely off, and the only attachment it has is to the thin floor of the cap. If after having enlarged the canal you will lean the reamer towards the palatal or lingual side of the root, thus sloping the canal in that direction, by bending the pin slightly it will leave plenty of room in front of it to place the facing without weakening it in the least by cutting. (Fig. 9.)

FIGS. 7. 8. 9. 10. 11. 12.



Another prolific cause of weakness is short and small pins. No doubt all of you have been called upon to reset crowns which have become loose for no other reason than that the pins were too short or too small. I have frequently seen a cuspid or a central incisor crown having a pin not more than three-sixteenths or one-quarter of an inch long, and of No. 17 or No. 18 wire, where the root would easily have taken a pin one-half, or even five-eighths, of an inch long and No. 14 or No. 15 wire, and the strain on the tooth would require it. In opening the canal it is always well to ascertain the length of the root first by passing a very fine broach through the apical foramen. You then know just how far you can go, and can make the pin long enough and large enough to give all the strength

required. There are very few teeth that will not take a pin at least three-eighths of an inch in length.

Half caps and shoes form very questionable anchorages. They certainly are not suitable for permanent work, as the cement is sure to wash out in time, the piece becomes loose and will have to be reset, and, where the other end is firmly fixed, it is painful and annoying to the patient to have it removed.

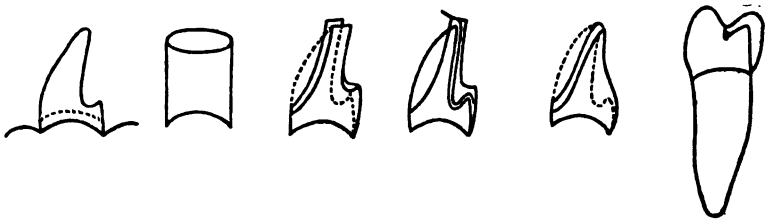
I have a bridge in my own mouth that was placed in position two years ago, being anchored at one end with a half cap to the first bicuspid. It is still firm, but if it stays so another year I shall think it will have done all that could have been expected of it.

The strength and lasting qualities of the half cap depends perhaps more than any other on the proper shaping of the tooth. The usual method of trimming the cuspid is to straighten the sides of the tooth and grind away the palatal surface, and here the work stops. The cap is then made and cemented in position. (Fig. 10.) A bridge anchored in this way cannot last, as the force exerted in mastication is sure to loosen it by stretching the band of the half cap in front and forcing it inward over the basilar ridge. My practice is, and I think it is the only way to prepare these teeth, first to trim the sides so that they are nearly parallel. (Fig. 11.) The tooth may be a little wider at the cutting edge than at the neck, as the cap can be sprung over it. Then grind away the palatal surface until it is quite concave. The next cutting is the one on which the stability of the piece entirely depends, and that is the cutting of a groove longitudinally across the back of the tooth, just above the basilar ridge. (Fig. 12.) For this purpose a bur or small corundum wheel can be used.

For the benefit of any who may not have used the half caps I will explain how they are made. The impression should be taken after the tooth has been prepared. After running the model and having it thoroughly dried, cut the plaster away from around the neck of the tooth to nearly one-sixteenth of an inch below the gum line. (Fig. 13.) Then give it several coats of thin sandarach varnish, and after this has dried the model will be hard, and you can proceed to make the cap. First make the band the full height of the tooth, and contour its edges so that it will touch the plaster all around. (Fig. 14.) Cut it out front and back so as to leave these surfaces of the tooth exposed, letting the edges of the band at the inner side extend a little beyond where the tooth has been cut away. (Fig. 15.) Next take a very thin piece of pure gold or platinum of the right width, let it pass over the basilar ridge inside

the band. Burnish it carefully into the groove and up the back of the tooth, letting it extend over the cutting edge. (Fig. 16.) Then cover it well with hard wax, remove, invest in sand and plaster, and restore the contour with 18- or 20-carat solder. (Fig. 17.) With a half cap made in this way there is very little strain on the

FIGS. 13. 14. 15. 16. 17 18.



band in front, and it makes no difference how much pressure is brought to bear, it cannot be forced back over the basilar ridge, and the pressure is directly downward or upward, and nearly over the centre of the tooth.

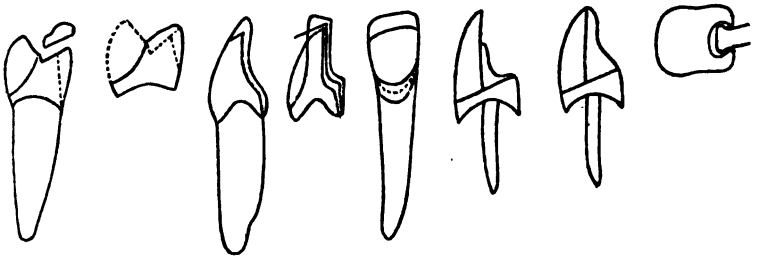
In the preparation of the bicuspid the same principle will apply. The sides should be made nearly parallel, and the swell should be taken off the inner side of the tooth, so that the band will pass over and touch the tooth all around below the gum. The inner cusp should then be ground off, cutting straight downward at the centre, and sloping it upward towards the point of the cusp. (Fig. 18.) In making the band it should be cut out at the buccal side and even with the top of the inner cusp, as it has been ground. (Fig. 19.) The cusp is made by fitting a small piece of platinum to the band after flowing over it coin, or the same metal as the band, to the required thickness, and soldering it to its place (Figs. 19 and 20), and, as you will see, any pressure has a tendency to crowd the piece more firmly into position. (Fig. 20.)

The trimming of a tooth for a shoe should be the same as for a cuspid half cap, with the difference that the groove need not be so marked, and the cutting edge should be ground off sloping downward or upward towards the gum. (Fig. 21.) The ears of the cap should extend beyond the cutting edge as far as is necessary to restore the length of the tooth. (Fig. 22.) The thin metal over the back should be burnished carefully over the cutting edge, between the ears of the cap (Fig. 22), and this space filled with the same carat gold as the band. (Fig. 23.) It is well with any of the above to double the band in front, thus overcoming the danger

of stretching, and making the piece more secure. In trimming these teeth the labial face should always be left intact.

The use of the spud, spur, or bar, as it is variously styled, is advisable in very few cases, and it is a question whether it is safe to rely on it at any time. It should never be used unless it can be

FIGS. 19. 20. 21. 22. 23. 24. 25. 26.



made large, and strongly dovetailed into the tooth (Fig. 24), and then only on very small bridges.

A great many crowns are used without bands, but they are certainly not so safe as a well-made Richmond crown, and should never be used in bridge-work. The cement is likely to wash from under them in time, and they are far more apt to loosen than where the root is properly banded. Then, too, the danger of the root becoming fractured is another argument against their use. Fitting the band is often a somewhat painful operation, but it is quickly done, and the patient will soon forget it if the piece is satisfactory.

After the bridge or crown is completed and fitted in the mouth, the articulation must be corrected. A great many bridges, and a great many plates as well, are placed in the mouth which are really of no practical use, owing to the malarticulation. It will be found in most cases where teeth have been out for some time that those in the opposite jaw have elongated, and have grown so far out that they may touch the gums where the teeth are lost. In such mouths it is impossible to do anything for the patient without first cutting these teeth to their proper level. This is usually a very painful operation for the patient to undergo, and some may object to having it done, but to secure good results and do your patients the greatest possible service it is absolutely necessary to grind them away until you can secure a normal articulation, and the patient will have to bear it. I have never yet had a patient who would not allow me to do what cutting I thought necessary.

I remember one case where a bicuspid had grown out so far as to lock the jaws, and the only movement possible was simply the opening and closing. It was a question either of extracting or grinding away. I chose the latter, devitalizing and cutting the tooth to its proper level.

I removed some pieces of bridge-work this last summer that had been on but a few months, and which were made to accommodate such teeth as these. Of course they were of no use to the patient, but were a constant source of pain and annoyance, as the teeth were not trimmed, nor were the bands properly fitted, and the least forward movement of the lower jaw would throw most of the teeth at least one-eighth of an inch apart.

This work cost the patient twenty-five dollars a tooth. A large part of the bridge-work that is done is as bad, if not worse, than this, and is it any wonder that a great many cry out that bridge-work is a failure?

I removed these pieces, trimmed the teeth as I thought they should be trimmed (although the patient winced a good deal), and put in others, and certainly nothing could be more satisfactory than that work is at the present time. I do not believe in grinding away more than is absolutely necessary, but it is a great mistake, whether putting in a plate or a piece of bridge-work, to let your dislike for cutting the natural teeth or pity for the patient deter you from doing what is really for their benefit.

It may be well to mention one other cause of trouble, and that is the breaking of facings. A great many times this is due to short backings, letting the porcelain extend away beyond the gold, and leaving the whole strain on the pins. (Fig. 25.) If you will let the backings extend to, or just beyond, the cutting edge of the tooth, and then flow solder well up to that point, it will make a stronger piece, as the force of the bite will come partly on the metal. (Fig. 26.)

The last, and a very important operation, is the cementing of the piece. As you are all, probably, more or less familiar with this part of the work I will say very little about it. The piece and teeth, or roots, should be as thoroughly dried as possible. Cement should be put well up into the canals and in all of the caps, and the bridge or crown forced quickly into position. It is well to use plenty of cement, and as the bridge is pushed to its place, the excess will be forced out around the edges of the cap. It is the custom with some to drill holes in the cap to allow the surplus to escape, and then fill these holes with gold, but this is a great

mistake, as the caps should be perfectly tight, so as to force the cement to every part.

Now, a few words about working on the model. For this purpose the hardest plaster obtainable should be used. I have given directions about preparing them while speaking on half caps. For all full gold or half caps, I think that the work can be done better and much easier on the model than in the mouth, and certainly it is far more agreeable to the patient. Where you intend to put on a Richmond crown, with a part of the tooth cut below the gum, it is, perhaps, easier to fit the band on the root.

There may be some who doubt the possibility of doing as accurate work on plaster as on the tooth, but you cannot tell what can be done until you have tried it yourself or have seen others do it. I did not think it could be accomplished until convinced of it by Professor Essig, of the University of Pennsylvania, from whom I learned what I know of model work. It certainly requires more skill and care, but after having mastered it, you will work in the mouth only when it is unavoidable.

Where a cap for a Richmond crown is made on the root, if, after taking the impression, a little soft wax is flowed around the inside of the band and on the pin, it will not be necessary to run the model of sand and plaster, but plaster alone may be used. After the cast has become hard, the cap may be taken off with a pair of heated pliers, and the wax burned away. It may then be replaced, and when the crown is ready to invest for soldering, it can easily be removed without having to be cut out, and there will still remain a perfect model on which, if it should be required, another crown could be made.

A volume remains to be written on this subject, and this paper but touches lightly on a few of the most important points. It is essentially a work of details, and it is by giving careful attention to these that the whole is made a success. Where the conditions are favorable and the work is thoroughly done, it is one of the very best things that you can do for your patients. Where the reverse is the case, it is one of the very worst, and the mouth might better have been left untouched.

DISCUSSION.

Dr. Darby.—I have been very much pleased while listening to that paper and in the examination of the work before it was read.

It is not often that we see such beautiful operations. If I mistake not, all of the nine teeth shown in the superior jaw have bands

around the roots, and yet none of these bands are visible from the front view, and there did not seem to be the least irritation of the gums about the teeth. To accomplish such results is no mean task, and you will agree with me that it shows great skill and accuracy of detail.

So far as bridge-work itself is concerned I have not had great experience. I have inserted quite a number of small pieces, and they have proven very satisfactory. I have seen a great many unsatisfactory ones, often the result of bad judgment and worse workmanship. There is no doubt but that much of the bridgework is of poor mechanical construction. When it has been nicely done the testimony of those who wear it is strongly in its favor. I recently saw an extensive piece of this kind of work. There were at least ten or twelve teeth attached to three or four crowns and roots. It had been in use several years, and was in every way satisfactory to the wearer.

Dr. Rymer, of England, was called upon, who said, "I fear in England we are very apt to run down bridge-work, and I think the reason is that we don't understand the way to make it. I am satisfied very few have been trained in the proper kind, but I see no reason why it should not be a success. I hope before I return to England to take with me some few hints, and I shall always have a pleasant remembrance of my first meeting with the Odontological Society of Pennsylvania."

Dr. Head.—May not a cantilever bridge often be more serviceable than one fixed at both ends? I have in mind two cases which may illustrate my meaning. In the first a lateral was to be inserted between a perfectly firm canine and central. The patient was anxious to avoid a plate. A half crown was fitted to the canine. A lateral, with a gold spur to rest against the palatine surface of the central, was attached. Thus in mastication the movement of the teeth did not tend to loosen the foundation of the structure, and yet all blows were met by efficient resistance.

In the other case, a second lower bicuspid was to be replaced. The lower sixth-year molar was covered with a Richmond crown, to which was soldered a gold second bicuspid. From this gold tooth a spur rested on a Richmond crown, previously placed on the first bicuspid. This has proved to be not only strong but cleanly, as a thread could be freely used, and yet the downward pressure absolutely sustained.

Dr. Peeso.—I have seen a great many cases where they have been cemented in or filled with gold, and unless they are strongly

dovetailed they are almost sure to work loose. They should be so that a thread can be passed under them and thus kept clean.

Dr. Jefferies.—I have not had a great deal of experience with bridge-work. I was reminded of a case similar to the one Dr. Head mentioned, which I put in a little over a year ago. It was the superior deciduous canine, lost by absorption of the root, and, as the patient had never cut her second canine, I suspended it to a first bicuspid, which happened to be short and didn't require a very large or conspicuous gold cap; it has a simple spur on the other edge, resting on the palatal surface of the lateral incisor, and it looks well and is perfectly firm and satisfactory.

My experience with bridge-work has been exceptionally favorable. I never put in a piece unless I am perfectly satisfied it will be permanent.

Dr. Kirk.—We have certainly had shown to us this evening that there are two kinds of bridge-work,—good and bad,—and particularly what is meant by the former. There are two questions that have arisen in my mind. In the first place, the question of repairing. Then the other point I want to ask about is this: What limitations does the essayist place upon the insertion of bridge-work? For example, I have been unfortunate enough to lose several teeth, —two bicuspids and one sixth-year molar on one side, and one bicuspid and a sixth-year molar on the other. Now, the teeth he would necessarily select as abutments for a bridge in my case are absolutely sound. In such a case as described, would he consider the insertion of bridge-work a proper thing to do, or would he advise me to wear a plate or go without, which I am now doing?

Dr. Peeso.—There are different ways of doing it. It would take too long to go into the details of the work.

Dr. Kirk.—Suppose between the abutments of a permanent bridge you have some three or four crowns, and one breaks, what method do you pursue in repairing?

Dr. Peeso.—I have never had to repair a piece in the posterior portion of the mouth. I do not make provision for possible breakage. The general practice (illustrating on board) is to drill and let the pin extend through, and, placing cement in between the face and the gold, rivet it in. I use a plate punch that you can apply readily over the tooth and grip with the point of the pliers and rivet by pressure. I don't think there is any danger of the face breaking off the cap. I have never had a facing break but in one lateral incisor, that I replaced two or three weeks ago where it had been broken off.

Dr. Truman inquired if that riveting process would hold, to which Dr. Peeso answered that it could be riveted so as to be quite firm by drilling holes and taking the entire strain off the face.

Dr. Head asked if it is not sometimes advisable not to put on a facing, but to have it all gold.

Dr. Peeso.—It would make it unsightly to have a strip of gold. The thin veneer of porcelain takes very little space, and leaves a solid triangular piece of gold which will give all the strength required.

Dr. Kirk.—I have had in two or three instances good results by riveting with the Bonwill mallet. I have been able by heavy blows to put on veneers very tightly by using the Bonwill mechanical mallet with a convex smooth point instead of a hammer or riveting punch.

Dr. Place.—I have in mind a young man who has all the molars missing on one side except the wisdom tooth, and that is perfectly sound; the first bicuspid is also perfectly sound, and the canine is missing. Would you devitalize the nerve of the bicuspid to put on bridge-work, or would you leave it as it is, or how would you arrange it?

Dr. Peeso.—This is a question very hard to decide. It would depend a great deal whether the tooth is very prominent or whether it shows very plainly. It is impossible to decide without seeing the mouth. It could be done by putting a full gold cap on the first bicuspid. Placing six teeth on two roots would make a pretty severe strain, but in a great many cases where the teeth are perfectly solid and firm, the case would last for a good many years.

I don't claim to be an expert, and do not feel capable of answering all questions, but during the time I have been engaged in the work I have given it careful study.

Dr. Darby.—Dr. Bonwill has just called my attention to a peculiar case of bridge-work which I showed him last spring. Two molars and a bicuspid had been lost from the inferior jaw. The teeth of the superior were all present and good. It was thought advisable to put something in this space, but a grave difficulty presented. The wisdom tooth, which was to form one of the abutments, had tipped very much forward, but was firmly fixed in the jaw. The first bicuspid, which was to be capped and form the other abutment, had tipped backward. It will therefore be seen that inasmuch as the space near the gum was much larger than between the ends of the teeth, it would be impossible to put the bridge in place if made in one piece. It was therefore decided to

make the teeth of gold (hollow gold crowns). This was done, and, when finished, the piece was divided between the caps covering the bicuspid and molar crown, leaving those two intact. The three hollow crowns were then filled with rubber and vulcanized. Two large screws were then put through gold, rubber, and all. The pieces were inserted separately, and when the cement was in the act of setting, the two screws were driven home, bringing the two halves of the bridge nicely together. The result was eminently satisfactory, and I cannot see how it could have been done in any other way.

Dr. Bonwill.—I look at the case of the essayist with a great deal of pleasure. To my mind it was evidently done very thoroughly, and it looks also, judging from the details given, that it should be very permanent so far as bridge-work can be permanent. Dr. Peeso has covered the ground very nicely, and, what is better, brings up many points against bridge-work. He is not willing to advocate it in every case; I don't think he would be foolish enough to attempt it in a good many I have seen. He may grow bolder as he goes on in the work, and probably overstep the bounds, as a great many others have done. Only one man out of a great many can do it.

I really see but one mistake in this gentleman's work, and that is in the articulation. Without proper articulation it is of little use to the patient. If he will take his case and put the lower jaw in lateral movement on either side, he will find there is no proper articulation. This effect you can see here (indicating) without difficulty. The only thing I would say to the essayist is, learn to articulate properly. Had this been done, the case he has brought here would have been of seventy-five per cent. greater value to the patient. It is impossible to articulate teeth as he has arranged them and get lateral movements.

I have never banded a tooth since 1873, when I commenced to put on crowns, cementing them with the best oxyphosphate. American teeth are not suitable for this work. Now that I use English crowns I have no trouble.

I have brought some casts with me to ask the essayist and those here what they would do under the circumstances. What teeth they would mutilate and from which they would remove the living pulps. They are extreme cases, and I wish your verdict upon them.

It will soon be necessary that dentistry be divided into specialties, and that dentists having cases and recognizing that some other one can do the work in a way that will be much better for the patient should send the patient to such a person, and not presume

to do it in an inferior way. All dentists should be willing to confess that in some matters there are others who can perform the work in a better manner than they can.

Dr. Truman.—I know comparatively little practically in regard to bridge-work. I am on record in this Association as in opposition to it and crowns, and I think we have had evidence sufficient to warrant opposition to at least unskilled work.

The first impression I received from the original Richmond crown was that a band placed around a tooth would certainly arouse pericemental inflammation, and that it could not be otherwise so long as it pressed on the pericementum, and I have never wholly abandoned that opinion. Therefore it has been a satisfaction to see this case so free from inflammatory conditions, and causes me at least to modify my former expressed views.

As Dr. Bonwill has stated, there is bridge-work and bridge-work. I question the general ability in the dental profession today to do this. I doubt whether it be possible for many who attempt it to place a band around a tooth that will not arouse inflammation. If the bands fail to fit the roots, inflammation is certain to be developed. It is because the essayist has placed those bands so thoroughly and so perfectly that fluids cannot pass in between them that he has avoided that difficulty. Now, who is capable of doing that? It requires a skilled mechanician. It requires more than this, a man capable of comprehending possible pathological conditions that are likely to supervene, and to understand exactly what he has to do to overcome them when they arise. The time has come for a division of dentistry into special work. There are some of us not capable of doing certain things, and we might as well know it and acknowledge it at once, and not undertake to do everything, oftentimes to the injury of patients.

Adjourned.

At the regular monthly meeting, held January 11, 1892, the President, Dr. Jack, introduced the essayist of the evening, Dr. G. W. Weld, of New York City, who read a paper entitled "The Syrup of Iron Chloride."

THE SYRUP OF IRON CHLORIDE.

BY G. W. WELD, M.D., D.D.S., NEW YORK.

Mr. President and Gentlemen of the Odontological Society of Pennsylvania,—I wish to gratefully express my convictions that no small share of any success which I may have met with in my experiments is attributable to the circumstance of my having had the assistance of one or two distinguished chemists, and the friendly encouragement of a goodly number of physicians residing in New York. Having been led by special circumstances, some seven years ago, to begin a series of experiments, I found it impossible to continue without sacrificing a large portion of time usually allotted to repose, at no inconsiderable cost of both health and spirits. The experiments have been associated with certain other disadvantages, which accounts for the imperfection of some of the first productions.

From the testimony of several physicians who have lately employed the preparation in their practice, I am led to believe that I have finally succeeded in changing an old reliable compound of iron into what may be considered a new compound, concerning which the merits are worthy the thoughtful consideration of the medical and dental professions.

Whatever may be thought of the syrup of iron chloride, I wish to observe just here that the experiments have been conducted in a grave and earnest spirit, my only aim having been to produce a compound of the chloride which could be presented in a potent and permanent form (not emasculated), easily assimilated, and accompanied with all the virility of the tincture without its objectionable features.

For a proper understanding of the subject (as the syrup of iron chloride is nothing more nor less than the tincture of the chloride of iron slightly modified), permit me to introduce the same by first making a few remarks on the tincture.

The tincture of the chloride of iron is made from the liquor ferri chloridi, and contains thirty-seven and eight-tenths per cent.

of the dry chloride. In making the tincture of the chloride, thirty-five parts of the liquor are added to sixty-five parts of alcohol. Attfield says "that the liquor which is used in making the tincture contains much free acid," which, it is claimed by some authorities, is necessary to prevent the precipitation of the basic salts of iron, and this free acid contained in the tincture constitutes one of the objections which has been raised against its use, because of its destructive energy upon the enamel of the teeth.

Before an audience composed chiefly of dentists and physicians it would seem to be almost the triteness of an observation to comment on the pernicious influence of free hydrochloric acid upon the structure of the teeth; but as we judge everything by contrast, and as the syrup of iron chloride is characterized by an absence of this one particular objectionable feature, I trust you will pardon me when I allude to the observations and conclusions of one or two other gentlemen who have experimented on the subject.

The results of the experiments of Dr. Smith,[1] of Edinburgh, Scotland, are interesting to both the physician and dentist. Dr. Smith experimented with eight of the compounds of iron, which at the time the experiments were made were most generally used as remedial agents. These were the saccharated carbonate of iron, twenty grains to an ounce of water; carbonate of iron, in the same proportions; syrup of the phosphate combined; the syrup of the iodide of iron and water, equal parts; the citrate of quinine and iron; the wine of iron; the sulphate; and the tincture of the chloride of iron. On examining the respective solutions after twenty-four hours, the teeth were found unaltered in those of the carbonate, saccharated carbonate, phosphate, iodide, citrate, and the sulphate. In the solution of the wine of iron, the liquid itself was somewhat turbid; the teeth, however, appearing to be untouched. In that of the chloride of iron, a turbid sediment filled the bottom of the bottle and covered up the teeth from view; the fangs of the teeth were somewhat soft and flexible, and the enamel easily scraped down. The sediment under the microscope presented an amorphous appearance. In conclusion, Dr. Smith further says that, of his experiments, it would appear that certain preparations of iron, when directly applied, do exercise a powerful effect on the substance of the teeth; and the ratio of the effects obtained would seem to prove that, of all the preparations employed in these, that of the tincture of the chloride of iron acts more powerfully; the sulphate of iron

[1] *Edinburgh Medical Journal*, 1886, vol. ii. p. 631.

next; and next to that again, although in comparison very immaterially, the wine of iron,—the other preparations of iron appearing to be inert.

At a somewhat later period, Dr. J. H. McQuillen, of Philadelphia, in speaking of the effect of this preparation of iron on the teeth, stated, in an article published in the *Dental Cosmos*,[1] that "a young lady, whose teeth, originally of excellent material, are now in the most dilapidated condition, informs me that she has taken the tincture of muriate of iron almost daily during the last year.

"In her case not only the affinity between the hydrochloric or muriatic acid and the lime in the teeth has been fully demonstrated, but, in addition, the impropriety of an indiscriminate use of that valuable remedy.

"Employed, as this agent sometimes is, for a week or weeks, with the direction to take fifteen drops every two hours in a little water, without any caution or corrective against its deleterious influence upon the teeth, it is no wonder that organs which are so important to health and appearance as the teeth should have their integrity seriously if not irremediably affected."

In connection with the direct action of the tincture upon the enamel, the experience of a physician of New York, Dr. E. M. Cameron, is worthy of more than a passing notice. Dr. Cameron, while visiting a sea-side resort a few summers ago, was called upon by a lady, suffering with intense pain, to have the right lower molar extracted. In the absence of a dentist, he succeeded, he said, in extracting the tooth. He was summoned again a few hours after to see his patient, whom he found suffering with an excessive hemorrhage due to the extraction. Not having the usual styptic,—the tersulphate of iron,—he applied upon a pledget of cotton a small quantity of the tincture of the chloride. On calling upon the lady the following day, he was welcomed with the exclamation, "Doctor, you have stopped the hemorrhage, but you have destroyed two teeth!" On examining the adjacent teeth, he discovered that the enamel on the anterior and buccal surface of the second molar and on the posterior and buccal surface of the second bicuspid was softened to such an extent that it could be easily scraped off with the finger-nail. The case made such an impression on his mind that ever after, when he found it necessary to administer the tinc-

[1] "The Deleterious Effects of the Muriate of Iron on the Teeth." Vol. viii. p. 345.

ture of the chloride of iron, he said he did so with a considerable degree of reluctance, and invariably cautioned his patients regarding its use, at the same time suggesting such precautions as he thought would best counteract its destructive influence.

One of the precautions generally suggested by the medical practitioner is to direct the patient to dilute with water. But chemical observation shows that water increases the destructive energy of the tincture of chloride of iron upon the structure of the teeth more than any other fluid. As an illustration, the effect of adding water to a simple solution of the chloride of iron is to give us basic salts of iron and the separation of free hydrochloric acid. If a freshly-extracted living tooth be immersed in the officinal tincture of the chloride,—say for a period of twenty-four hours,—we shall find that the enamel, the most susceptible portion of the tooth, is not injured in the slightest degree; but if the same tooth be immersed in the tincture diluted with water, in proportion of one to eight,—*i.e.* one part of the tincture and eight parts of water,—we shall find that the enamel is materially injured within a period of one minute. It is not, therefore, entirely a matter of the strength of the acid that is likely to injure the teeth, but a matter of fluidity or solubility. To illustrate still further: When a piece of zinc is immersed in strong sulphuric acid (H_2SO_4), it will be observed that the acid has no effect upon the structure of the zinc; but if a little water be added to the acid, we find that the zinc is immediately attacked by the acid. The zinc in the strong sulphuric acid is protected from destruction in the same manner that the enamel of the tooth, which is immersed in the strong tincture of chloride of iron, is protected,—viz., the surface is blocked up with the basic iron salts, insoluble in alcohol, which prevents chemical action. In case of the zinc, it is the sulphate of zinc resulting from the first action, which is insoluble in the concentrated acid, that forms a protecting coat over the surface of the zinc. The addition of water dissolves this protecting sulphate and renders further chemical action possible. In case of a tooth immersed in the pure tincture of the chloride of iron, a similar action takes place,—viz., the oxide of iron first formed protects the tooth from immediate chemical action, owing to its compact adherence to its surface. As additional testimony relating to the injurious action of the tincture of the chloride of iron upon the teeth, I might add that almost all authorities on therapeutics and materia medica have expressly laid down the fact that the acid and astringent preparations of iron act on the teeth with considerable energy.

It seems unnecessary, therefore, to cite any more cases, either for the purpose of showing the destructive tendency of the above-mentioned preparation of iron on the enamel of the teeth, or that physicians or dentists are ignorant of such a condition of affairs. It is now, I believe, generally admitted by almost every one who, I might add, has had an opportunity of observing the effects, that the tincture of the chloride of iron, although passing transiently through the mouth and over the surfaces of the teeth, nevertheless exerts a most powerful and pernicious action on their structure.

We will now consider the so-called indirect or secondary effect of acids on the fluids of the oral cavity.

It has been observed by one or two prominent gentlemen in the dental profession that, after taking the tincture of iron for a certain period of time, the saliva, ordinarily alkaline, became acid in reaction,[1] and the question has been raised whether such a condition of affairs might not seriously affect the integrity of the teeth. It is possible that the ingestion of a large quantity of acids, even in normal health, may decrease the alkalinity of the blood to such an extent that the glandular secretions of the mouth will be rendered more or less acid. I can only say that I have never been able, although I have taken a large quantity of the mineral acids, to produce such a change in the secretions of my own salivary glands.

We know that the urine, which is normally acid, is very susceptible of a change. But it must be borne in mind that the urine has a character altogether peculiar, and one which distinguishes it completely from every other animal fluid. All the others are either nutritive fluids, like the blood and milk, or are destined, like the secretions generally, to take some direct and essential part in the vital operations. Many of them, like the saliva and the gastric and pancreatic juices, are reabsorbed after they have done their work, and again enter into the current circulation. But the urine is merely a solution of excrementitious substances. There is a wide difference, accordingly, between the action of the kidneys and that of the true glandular organs, in which certain new and peculiar substances are produced by the action of the glandular tissue. The kidneys alone are purely excretory in their offices; and the urine is not intended to fulfil any function,—mechanical, chemical, or otherwise;

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[1] "Human Physiology," Dalton's fourth edition, p. 333; see Dr. Bogue's remarks, INTERNATIONAL DENTAL JOURNAL, August, 1891.

but it is destined only to be eliminated and expelled. It is not surprising, therefore, that most medicinal and poisonous substances introduced into the circulation should be expelled from the body by the same channel. Those substances which tend to unite strongly with the animal matters, and to form with them insoluble compounds, such as the preparations of iron, lead, silver, arsenic, and mercury, are least liable to appear in the urine. They may occasionally be detected in this fluid when they have been given in large doses, but when administered in moderate quantity are not usually to be found there.

Most other substances, however, accidentally present in the circulation, pass off readily by the kidneys, either in their original form or after undergoing certain chemical modifications.

The salts of the organic acids, such as lactates, acetates, molates of sodium and potassium, when introduced into the circulation, are replaced by the carbonates of the same bases, and appear under that form in the urine. The urine accordingly becomes alkaline from the presence of carbonates whenever the above salts have been taken in large quantity, or after the ingestion of fruits and vegetables which contain them.

Bartholow,[1] in his treatise on Materia Medica and Therapeutics, says that "the mineral acids, especially hydrochloric, have been proposed as remedies for ACUTE RHEUMATISM.

"The unquestionable utility of the tincture of the chloride of iron in rheumatism lends support to this practice. It is highly probable that the mineral acids check the formation of lactic acid in the blood." On another page the same author states,[2] "The mineral acids, when administered in medicinal doses, must on reaching the stomach act in accordance with their chemical position: they will combine with the bases and form salts; hydrochloric,

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[1] "A Practical Treatise on Materia Medica and Therapeutics." Roberts Bartholow, M.A., M.D., LL.D., third edition, p. 87.

Professor Lehmann found that the urine exhibited an alkaline reaction a very few minutes after the administration of lactates and acetates. In one instance, by experimenting upon a person with congenital extroversion of the bladder,* in whom the orifices of the ureters were exposed, he found that the urine became alkaline in the course of seven minutes after the ingestion of half an ounce of acetate of potassium.

[2] "A Practical Treatise on Materia Medica and Therapeutics." Roberts Bartholow, M.A., M.D., LL.D., third edition, p. 83.

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* "Physiological Chemistry," vol. ii. p. 133.

and to a less degree phosphoric, aid digestion, acting as synergists to pepsin, and contribute to the formation of peptones. . . . It is true of all the mineral acids that their long-continued use diminishes the production of acid gastric juice, and in this way after a time they cause the very trouble for the relief of which they were originally administered. An acid solution on one side of an animal membrane and an alkaline solution on the other, is the condition most favorable to osmosis, hence the introduction of an acid into the stomach with sufficient quantity must impair the production of acid gastric juice. In practice this is found to be the case. The mineral acids are among the most diffusible substances known, and of these hydrochloric stands at the head; so much of these acids as do not enter into combination in the stomach diffuses quickly into the blood, and the salts which they form by combination with bases follow the laws of diffusion according to their class. The acids, especially the hydrochloric, and next nitric, diminish the alkalinity of the blood."

The researches of Garrod[1] are also interesting in connection with the subject. His researches appear to show that the pathology of certain forms of rheumatism, particularly gout, involved a peculiar morbid condition of the blood,—viz., an accumulation of uric acid, of which the blood in health contains a trace.

There is no authority, however, so far as I am informed, for assuming that the human saliva is ever rendered acid by the presence of acid in the blood; and because the urine is easily changed from an acid to an alkaline reaction, it in nowise follows that the saliva can be changed from an alkaline to an acid condition.

There appears to be but two ways to account for the statement recently made by Dr. Bogue,[2]—viz., that after taking the tincture of the chloride of iron he observed that "acid in his *saliva* was distinctly perceptible."

1. The presence of free acid in the blood.

2. A derangement of the secreting glands; the admixture of mucus; and the production of the *sympathetic saliva*[3] of the physiologists.

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[1] In forty-seven cases of gout, an analysis of the blood-serum by the same experimenter showed a notable increase of this constituent.

[2] See Dr. Bogue's remarks made before the Odontological Society, New York, and published in INTERNATIONAL DENTAL JOURNAL, August, 1891, p. 552.

[3] The reflex secretion of saliva by means of the *chorda tympani* nerve, etc.

Regarding the first point, it may be said there is no chain of evidence from a physiological stand-point which affords any reason for believing that such a condition of affairs ever exists. Of course it is unsafe to say *a priori* that a certain thing cannot take place, especially when a careful and observing man like Dr. Bogue says that it does. But, as I recently stated in my lecture read before the Odontological Society of New York, I am unable to find any authority, and I know of no good reason for believing, that the secretions of the glands of the oral cavity can be rendered acid *by the ingestion of acids.*[1] It has been observed that in an animal where the alkalinity of the blood approaches even a neutral point the animal will die.

The presence of alkalies is essential to the oxidation of the organic constituents of this fluid,—in fact, as necessary to the life of the corpuscles as water is necessary to the life of a fish, or common air to the life of mankind.

Wright[2] found, on injecting various acids into the veins of healthy dogs, that in only one instance did the salivary glands excrete the injected acid. The subject of this observation was a strong bull-terrier dog, into the veins of which has been thrown three drachms of pyroligneous acid diluted with six ounces of water. At first the saliva became very frothy and alkaline,

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[1] Wright states, it rarely happens that the salivary glands, when in a state of healthy activity, perform an excernent function to free the blood from any temporary impurity, unless the organs proper for this task shall fail in discharging it.

1. The reaction of the blood is alkaline owing to the presence of disodic phosphate, NA_2, HPO_4. (Maly.)

2. The alkalinity is less in persons suffering from anæmia, cachectic conditions, and chronic rheumatism. (Lépine.)

[2] See Piggott on saliva, *American Journal of Dental Science*, vol. iii p. 342.

Piggott on morbid change of saliva, *American Journal of Dental Science*, vol. iii. p. 582.

Later experiment by Lehmann and Jacubowitsh have not supported all the results obtained by Wright.

The parotid saliva is obtained by placing a fine canula in Steno's duct (Eckhard); it has an alkaline reaction, but during the first few drops may be neutral or even acid on account of free CO_2 (Oehl); its specific gravity is 1003 to 1004. *Salivary calculi* are formed in the ducts of the salivary glands, owing to the deposition of lime-salts, and they contain only traces of the other salivary constituents; in the same way is formed the *tartar* of the teeth, which contains many threads of leptothrix, and the remains of low organisms which live in decomposing saliva in carious cavities between the teeth.

continued so for six hours, at the expiration of which time it was discharged very copiously, and found to contain acetic acid. Mitscherlich says that the reaction of the saliva is usually alkaline during a meal, and neutral or acid when fasting. This statement, which was first made by Mitscherlich,[1] has been confirmed by Marshall and Garrod. These latter observers are inclined to attribute this to the rapidity of the discharge during a meal, and the slowness with which the secretion is formed at other times. They found that ordinarily but two or three drops were discharged by one parotid gland in a quarter of an hour, and that was acid; but in half a minute after a morsel, reaction was neutral, and within the minute alkaline. This continued until twenty minutes after the meal, when it again became acid. *This is accounted for by the fact of the general acidity of the mucous surfaces of the mouth, which is sufficient to overpower the feeble alkalinity of the saliva when secreted in small quantity.*

Ziemssen,[2] in speaking of the acidity of the mouth in diabetes mellitus, says that the patient's *sense of taste* is commonly altered, being stale and clammy, and not infrequently, too, decidedly sweet, —the latter being due, probably, in many instances, to the presence of sugar, which, according to MacGregor, Nasse, Hetter, Lamperhoff,[3] is often found in the oral cavity. The transformation of the sugar into lactic acid is probably also the cause of the oral fluid in diabetics almost always showing an acid reaction. On another page the same authority, in speaking of the chemical alteration of the saliva during salivation, states that the saliva has been examined by many chemists,—Gmelin, Thomson, Simon, Ure, Bird, Garrod, Lehmann, and Wright,[4] have worked at this subject. At the commencement of the flow the specific gravity is usually very much increased, being as high as 1059, while it hardly reaches 1010 in normal saliva. This increase depends upon a greater admixture of mucus,—the sympathetic saliva of the physiologists,—some albumen, and an increase in the salts. In the course of

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[1] Landois and Sterling's "Physiology," vol. i. p. 291.

[2] Ziemssen's "Encyclopædia of Medicine," vol. xvi. p. 911.

[3] "In Karth de Dyscrasia Saccharina Diss Brown," 1840; ibid., vol. vi. p. 853.

[4] See *Lancet* for 1841 and 1842; Marshall and Garrod's experiments in same journal; G. Owens Rees on saliva, in the "Cyclopædia of Anatomy and Physiology;" Simon's "Chemistry of Man;" the article on Lehmann's "Physiological Chemistry," in the *British and Foreign Medico-Chirurgical Review* for October, 1851.

the salivation, however, the specific gravity falls almost down to that of distilled water. Wright found it 1001.5 in one instance; with the subsidence of salivation the saliva usually acquires its normal characteristics again. Its reaction is either normal, slightly alkaline, or it is neutral or even slightly acid, due to the increase of the already souring mucus.

Landois and Sterling,[1] in speaking of the abnormal constituents of the saliva, state that decomposition products of epithelium salivary corpuscles, or the remains of food, may render it acid temporarily, as after long fasting and after much speaking (Hoppe-Seyler). Even outside the body the saliva containing much epithelium becomes acid before it putrefies (Gorup-Besanez). The reaction is acid in some cases of dyspepsia and in fever, owing to the stagnation and insufficient secretion; also that in diabetes mellitus, lactic acid, derived from a further decomposition of grape sugar, is found (Lehmann). It dissolves the lime in the teeth, giving rise to diabetic dental caries.

Foster[2] states that "the parotid saliva in man is clear and limpid, not viscid; the reaction of the first few drops secreted is often acid, the succeeding portions, at all events when the flow is copious, are alkaline,—that is to say, the natural secretion is alkaline; but this may be obscured by acid changes taking place in the fluid which has been retained in the duct, possibly by the formation of carbonic acid; . . . submaxillary saliva in man and in most animals differs from parotid saliva in being more alkaline and, from the presence of mucin, more viscid." Concerning the pathological aspects of saliva, Kingzett[3] states that the presence of lactic acid in saliva has been frequently asserted; but while there is great doubt about it, it is certain that during some diseases the saliva grows more or less acid; thus, according to Donne,[4] saliva is acid in inflammatory affections of the primæ viæ, in pleuritis, encephalitis, etc.

Wright assumes the acid state sometimes observed in saliva to be referable to, among other diseases, rachitis. But all these, and many similar observations, are not worth much credit, being too vague, and admitting of no reduction to definiteness. It is also said that lactic acid is to be found in saliva in cases of diabetes, but the statement has as often been contradicted.

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[1] Landois and Sterling's "Physiology," vol. i. p. 298.

[2] Foster's "Text-Book of Physiology," vol. ii. p. 362.

[3] Charles Thomas Kingzett, F.C.S., "Animal Chemistry." London, 1878, p. 53.

[4] "Histoire Physiol. et Pathol. de la Salive." Paris, 1836.

Now, if Dr. Bogue, before experimenting, will wait until the first few stagnant drops of saliva have flowed off, he will undoubtedly find that the reaction of the saliva *per se* is alkaline.

The experiments of Dr. Henry L. Chase, of St. Louis, are worthy of consideration. Dr. Chase experimented and tested the reaction of the saliva of more than five hundred different animals. In a letter published in the *Dental Cosmos*[1] of 1868, correcting the report of the Committee on Chemistry, he says, "In the paper, I stated that I had found the mixed saliva of the mouth to be acid in nearly every person whom I had examined, being more than two hundred; . . . that I had found in every case, in a minute or two after a meal, the saliva to be either alkaline or neutral.

"That I consider a physiological condition of the mixed saliva to be either alkaline or neutral; that I found the saliva of the lower animals, such as horses, cows, etc., to be alkaline, provided they were living in a natural condition.

"That I found the saliva of cows, shut up where large numbers were herded together in stables, to be acid."

There is nothing expressed in Dr. Chase's monograph, however, which affords any good reason for assuming that the ingestion of acids, in medicinal doses, can in any way change the reaction of the saliva, although he makes the statement "that the saliva may be rendered *sour* by partaking inordinately of acids;" but he gives no proof. In justice to Dr. Chase, I have quoted his letter of explanation, for it materially modifies some of the statements made in his paper.

I do not question the sincerity or the results of his experiments, but I do question the method by which he obtained those results; for it must be observed that his experiments concern only the mixed saliva, and, of course, the first few stagnant drops, which, as I have already stated, are generally acid in reaction. If he will insert a fine canula into Steno's duct, and test the reaction of a small quantity of pure saliva, he will very probably admit that his paper, so far as it relates to the reaction of the saliva, is, to say the least, misleading.

Mention may be made of the bacteria theory of Miller[2] in con-

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[1] *Dental Cosmos*, vol. x. p. 547, "Character and Uses of the Saliva," read before the American Dental Association, July, 1868.

[2] Dr. W. D. Miller, Berlin, "Fermentation in the Human Mouth: Its Relation to Caries of the Teeth."

Thanks are extended to Dr. A. L. Northrop, New York, for the privilege of access to his valuable library.

nection with the disintegration of tooth-substance and the solvent action on their lime salts. Dr. Miller's experiments show:

1. "That fungi-bacteria constantly exists in the mouth, and especially in and around carious teeth, and as a resultant of their growth and increase a ferment-lactic-acid is produced.

2. "That these fungi can be isolated, their specific character determined, and their life-history studied.

3. "That artificial caries can be produced by placing teeth in a 'pure cultis' of these fungi, which cannot be distinguished microscopically from natural caries."

Dr. Magitot's[1] experiments are worthy of mention. He says, "It is perfectly established that dental caries results from the direct alteration of the organ by means of substances which originate in the saliva or are accidentally introduced,—an alteration usually preceded and favored by certain congenital or acquired predispositions of structure or anatomical conformation. Caries, regarded from this point of view," he says, "consists, then, precisely in a simple solution of the calcareous salts of the dental tissues by an acid element developed or brought in contact with them."[2] It would seem that this author places acids introduced into the oral cavity upon the same plane as those developed in contact with the teeth.

From carefully weighing all the effects that have been produced and all the doings that have been achieved in the matter, I am forced to conclude that the disintegration of tooth-structure in conjunction with a chemical hypothesis, may be summed up as embracing two points, viz.:

1. The direct action of acids introduced from without. (The complete disintegration by a mineral acid applied at the very spot where the erosion had its beginning has already been alluded to in the cases mentioned by Dr. Cameron.)

2. The lodgement of food and the presence of bacteria in out-of-the-way points about the teeth, followed by decomposition, fermentation, and the evolution of acids thereof.

One word regarding erosion in connection with the acid-mucus theory and the affinity which exists between acids and the enamel and dentine. The idea that erosion is probably due to the solvent

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[1] See monograph of George S. Allan, D.D.S., New York, "Caries of the Teeth: Its Prevention and Treatment." Odontological Society, New York, April, 1886.

[2] See remarks of G. V. Black, M.D., D.D.S., "Dental Caries," INTERNATIONAL DENTAL JOURNAL, vol. i. p. 749.

action of acid-mucus, secreted by the follicles situated in the *labial mucous membrane*, was first advanced by Professor James Truman. This theory has, I believe, been accepted by Drs. Black, Kirk, and a number of other authorities; and to account for the erosion which is sometimes found upon the lingual surfaces and the distal points of the teeth, it has been held that the follicles at the tip of the tongue also secrete an acid mucus.

All my experiments relating to the effect of acids upon lime-salts of the teeth demonstrate most emphatically that the enamel is more susceptible to the influence of all kinds of weak acids than the dentine, and that invariably the enamel will first be attacked and destroyed. Not infrequently, however, in cases of erosion, we find the *dentine* on the grinding surfaces of the teeth scooped out, so to speak, leaving a hollow cavity, which is surrounded by a thin edge of enamel, which, if we assume the acid mucus is the cause, should have first been destroyed. I touch upon this point now in view of Dr. Kirk's experiments and for his future consideration when studying the etiology of erosion and the cause of the acidity of the mucous follicles of the mouth.

Notwithstanding the objectionable features of the tincture of the chloride of iron,—viz., its peculiar and obnoxious taste, its liability in many cases to excite nausea and vomiting, and its extremely acid and astringent properties,—it is frequently employed by physicians, not only in the treatment of anæmia, but also in large doses in the treatment of erysipelas, neuralgia, diphtheria, epilepsy, acute rheumatism, and other disorders which might be mentioned. It acts also as a diuretic; even in ordinary anæmia many authorities prefer it to any other preparation, claiming that its effects are shown much more quickly, and that it seems to act more satisfactorily. Almost all agree that it possesses special virtues, either constitutional or local, which render it useful in the above-mentioned disorders. These peculiar properties (especially the diuretic effect) are ascribed by some to a peculiar ethereal compound, resulting from the mixture of the *liquor ferri chloridi* and the alcohol used in making the tincture, to which compound its odor is due.

As I stated in the beginning of this paper, the SYRUP OF IRON CHLORIDE is simply the tincture of the chloride of iron in a slightly modified form, a sufficient quantity of alkali having been added to counteract the free hydrochloric acid, and a small quantity of the syrup of gaultheria (which, it is claimed, in certain disorders, has a therapeutic value), to render it more palatable. In other words,

the excess of acids over and above that necessary to form a perchloride of iron has been eliminated. The preparation is, therefore, acid in reaction; but the relative proportions of the acid and iron have been adjusted so delicately that, although sufficiently acid to prevent the precipitation of the basic salts of iron, it is not enough acid to injure the enamel of the teeth. And it is to be noted that, while the teeth are protected from injury, as soon as the preparation passes through the mouth into the stomach it meets with more hydrochloric acid,[1] and is likely returned again to its original condition, or nearly as it was in the original tincture of the chloride;[2] accordingly, it may be said that the therapeutic value of the syrup corresponds with that of the tincture. Moreover, it is claimed that the syrup as a restorative agent is easily assimilated and more likely to be tolerated by the mucous membrane of weak stomachs than the old form of the *acid chloride*, and is less harmful under prolonged use.

It is not claimed that all of the objectionable features of the tincture have been removed. For instance, the syrup possesses the same special and styptic qualities as that of the tincture, and it necessarily follows that there will be a correspondingly physiological effect produced on the mucous membrane of the bowels. It will be necessary, therefore, for the physician (as when using the tincture) to pay proper attention to this particular functional disorder.

It has been observed by Dr. Dana, of New York, when administering the syrup of iron chloride to children (when tonic remedies and supporting measures of treatment were indicated), that the tongue of the patient was less likely to be discolored than when the tincture was employed; and he has been enabled to more clearly define the presence of sordes. It is not claimed, however, that the *syrup* will not discolor the teeth. In reference to the latter, the same may be said of soft-boiled eggs and the various kinds of salad-dressings; but in all cases after the discoloration has been removed, the enamel and structure of the teeth are found to be intact.

The following cases have been reported to me by physicians who have employed the preparation in their practice:

Case I.—By Dr. Cyrus Edson, chief inspector, Board of Health, New York City.

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[1] It is supposed that hydrochloric acid is produced in the stomach by a reaction between the chloride of sodium and lactic acid.

[2] See Professor Elliott's remarks before New York Odontological Society, International Dental Journal, August, 1891, p. 554.

Mrs. P., aged thirty-eight years, came to me suffering from a severe attack of anæmia and sciatica. She had been troubled with sciatic pains for four months previously, and although she had been under treatment by three other physicians, she had obtained no relief.

The etiology of the sciatica, as far as could be ascertained, was the history of severe grief, due to the loss of her son. I gave her an aperient (cascara sagrada) morning and evening, also ordered Weld's tincture of chloride of iron, to be taken three times a day, after meals, in four-drachm doses.

It is now one month since the last consultation. All pain has completely disappeared, and her blood is in excellent condition.

Case II.—Mr. C., age thirty-seven years; physical condition about the same as the patient in the previous case, though of much longer standing.

He has been troubled with sciatica, associated with anæmia, for about three years, but it is only within the last year that the pain has been continous.

I made use of subcutaneous injections of *aqua pura* along the course of the sciatic nerve; and also to improve the condition of the blood, Weld's tincture of iron.

The patient has been under my treatment for about a month, and complains now only of slight intermittent pain during the night. Physical appearance much improved.

Case III.—G. C., a child, eight years old, residence, Tremont, New York City, had a very bad attack of malarial fever followed by *anæmia*. I put him on Weld's tincture of iron, with the result of a decided amelioration of all the symptoms within two weeks.

In all the above cases the patients experienced no trouble in taking the preparation, and the teeth suffered no deleterious effect.

As far as my experience extends, I can say that Weld's preparation contains all the advantages, without any of the disadvantages, of the officinal "tinctura ferri chloridi."

Case IV.—By Dr. H. B. Bayles, sanitary inspector, Board of Health, Brooklyn, New York.

Mr. B. was taken with a chill on September 4, 1891, with slight elevation of temperature. The condition of moderate fever continued for several days, and developed, as was expected, into what was supposed to be a mild case of typhoid fever. In due time the eruptions occurred, and, aside from general debility, he did not complain of any very annoying symptoms; no profuse diarrhœa; in fact, being what might be termed comfortably sick.

This state of affairs continued till the sixteenth day of his illness, when he was attacked with epistaxis (not profuse); the next day there were extensive purpuric spots over the entire body, hemorrhages from the tongue and gums, and copious hemorrhages from the bladder. The temperature remained at 100.5° F., the pulse at 124,—the patient completely exsanguinated and in a critical condition. This state of affairs continued about one week. The treatment consisted of stimulants, heart tonics, and tinctura ferri chloridi. The iron was given in moderate doses and frequently; but the stomach, heretofore manageable, became rebellious, and rejected it. When the old reliable preparation of iron had to be abandoned, I considered my mainstay gone. Having the same day received a large bottle of the modified tincture of iron, prepared by Parke, Davis & Co., after the formula of Dr. G. W. Weld, of New York City, I immediately gave the same, commencing with one tablespoonful, and increasing to three tablespoonfuls every two hours. This preparation was tolerated by the stomach, gave rise to no nausea, and was taken continuously in varying doses for several weeks. I had the extreme satisfaction of seeing my patient restored to perfect health, and to learn that the old reliable tinctura ferri chloridi had been so modified that its greatest drawback had been removed, and that it was rendered an agreeable preparation.

Case V.—By Dr. A. H. Dana, New York City.

Louis L. had been suffering from typho-remittent fever for a period of five weeks. As usual in such cases, he was very much debilitated and in an anæmic condition. His stomach at the end of the fourth week was extremely irritable, and he was unable to retain anything in the way of food or medicine. Iron in some form was indicated. I used a number of preparations without success. Having had my attention drawn to the syrup of iron chloride, I immediately prescribed it, giving him five tablespoonfuls each day. The effect was immediate: his nausea ceased, the digestive organs resumed their normal function, and he rapidly improved and regained his health.

I have since prescribed this preparation in three other cases with equally gratifying results.

FROM R. A. CALDWELL, M.D.

"24 West Thirty-second Street, New York City.

"I have used the syrup of iron chloride with gratifying results. I believe it will prove a most valuable and permanent part of the armamentarium of our profession."

"15 West Thirty-seventh Street,
"New York City, December 30, 1891.

"G. W. Weld, M.D.:

"Dear Sir,—Permit me to say that I immersed a tooth, with perfect enamel, in the 'syrup of iron chloride,' for a period of two hours, and so far as I can see, the enamel has not been affected in the slightest degree.

(Signed) "George A. Allan, D.D.S."

FROM PARKER SYMS, M.D.

"55 West Thirty-sixth Street, New York City.

"The syrup of iron chloride possesses valuable points."

DISCUSSION.

This was followed by a discussion, which was opened by Professor A. H. Elliott, of New York, who said: I first became interested in this subject from some experiments of my friend, Dr. Weld, five or six years ago, when he brought to my notice the astonishing fact that he could neutralize the acid of the salt of iron without precipitating it. At first I was inclined to laugh at him. After he had demonstrated to me that it was so I went to his office and saw some experiments he was making with Vichy water, and he was adding this in very liberal quantities to tincture of muriate of iron without precipitating it. It certainly was a fact, but it was rather contrary to my preconceived notions of chemical reactions. Never theless he interested me in the action of tincture of iron and acids upon the teeth, and I made an analysis of the enamel and arrived at its chemical structure, and I also undertook experiments with regard to the action of acids on the teeth, and this led me to think of the possible union that could take place between Vichy water and the iron salt which he had certainly neutralized.

All the authorities upon the preparation of the tincture of chloride of iron are agreed that you could not have a tincture of chloride of iron minus the free acid without precipitating it.

It has been concluded that free acid in conjunction with alcohol formed ethyl chloride which forms in tincture of chloride of iron and thus eliminates the acid, but that is evidently not so. Dr. Weld's experiments with the teeth and also in connection with carbonate of lime and other substances have proved beyond a question that acid is still present in tincture muriate of iron.

In the action of acid upon the teeth, certain modifying circumstances can take place. Suppose we get rid of all the hydrochloric acid, and that we have nothing but the pure perchloride of iron left with the minimum amount of acid. If you place any substance in

it that is capable of reacting with it, as carbonate of lime, which is part of the enamel of the teeth, you could readily get chloride of calcium from the carbonate of lime and you would get basic carbonate of iron. So if we could get tincture muriate of iron without acid that would not precipitate, we should be all right; that is, get it free from acid and not precipitate basic salts of iron; we must get the fluid into the condition that it will not allow the salts of iron to diffuse. That is, it should make them adhere to the teeth and thus protect them, or if this will not do we must introduce something else to prevent it. The doctor has not only succeeded in eliminating the acid, but he has succeeded in eliminating the action of the chloride of iron itself, or rather prevented the action of chloride of iron upon the enamel of the teeth by having there a dense syrup in which the iron compounds are partially soluble.

While he was speaking I made one or two notes: "The reason that the tooth is not acted upon by the concentrated tincture of muriate of iron, he showed, was due to the fact that alcohol present in it prevents diffusion of the iron salts into the fluid." With regard to acid saliva, I am not a physiological chemist, but I think of these things in connection with chemical facts, and it appears to me that in every case where the saliva is said to have been acid, it is under circumstances where no precaution has been taken to get rid of the food adhering to the mouth, and it is not improbable that after it has passed the mouth, the residue has become the victim of bacteria. Fermentation has been set up by the substances that have been left in the food adhering to the mouth, and that is probably the cause in many cases of the apparently acid reaction of the saliva.

There was a case cited where a number of cows had been fed on distillery slops. That is acid. We have had a great many cases of that kind in New York. The slops were often acid, and of course, if a cow has been living on that food, why should not the interior of the mouth be of the same character, unless it be thoroughly washed out?

Dr. Dwinelle, New York.—Probably this question influences or affects no profession more than it does ours. It is well known, or used to be with me, that the mere tincture of iron was one of the most important tonics we had to deal with, and in a short time it has been eliminated from that as the great objection,—its action upon the teeth,—and we are trying to resort to mechanical and other means, such as tubes, quills, etc., to avoid the hydrochloric

acid coming in contact with the teeth. So much has been this objection that in many cases they do not use it at all; it has been almost abandoned by the profession, but since this preparation has come to the front we are encouraged to believe we can resort to it and secure the advantages we have derived from it heretofore. I trust that will be the case.

Some singular chemical facts have come to our knowledge through Dr. Weld's paper,—almost an anomaly, almost a contradiction; in fact, it is somewhat like the homœopathic theory,—the weaker a thing is the stronger it is.

We have seen by experiments that when the teeth have been in conjunction with pure hydrochloric acid the action is slow, but reduce it by eight times its volume of water and it at once becomes potent, powerful, and effectual. Dr. Weld must be the first one who made that discovery. The elimination of the free acid, or causes of acid, removes one of the objections so far as the teeth are concerned; furthermore, the removal of the acid renders it more acceptable to the stomach and the mucus membranes at large; in eliminating it in this way it is more readily tolerated, and becomes an agreeable medicine to take.

This subject that Dr. Weld has given us is a text we can preach upon at our leisure, and can make very profitable for thought. There is no profession that it interests more than our own. It is a most interesting subject, and we will all profit by it.

Dr. Mills, New York.—The paper has interested me very much and I think I cannot do better than to bring to the notice of the meeting something that has attracted my attention in several journals; among the rest was the *Commercial Advertiser*, and also an article in the *North American Review*, in which is given the past and future of medicine, and the writer arraigns medicine for the slow progress made. Among the other criticisms are some things I think might be profitably brought to our attention in the dental profession. He says that among the things that have stood in the way of progress and scientific action among medical men is the want of mental culture, and a lack of scientific ambition to investigate special subjects. He speaks of the few remedies that have any peculiar bearing upon the practice in special diseases. It seems to me that this paper has impressed itself on my mind in this direction. Dr. Weld has exhibited here his ability to prove that he has some scientific ambition. We ought to congratulate ourselves that we have one among us who can bring such a paper as this to our attention. He has brought forth a specific remedy, and by

taking away the hydrochloric acid he is able to take away the deleterious effect of the action upon the enamel.

Dr. Jas. Truman.—I was extremely interested in the doctor's former paper read before the Odontological Society of New York, and was especially gratified that he had taken up this subject and had carried it forward to the extent he had at that time. He has shown us to-night the possibility of using chloride of iron without injury. It is a subject that has claimed more interest in the dental profession than it has, unfortunately, in the medical. Every individual in practice has known of the disastrous results that have followed the use of chloride of iron, many cases occurring where our best efforts have been neutralized by its use. In my own experience I might recite many very serious cases where whole sets of teeth have had portions of the anterior surfaces destroyed by a treatment of chloride of iron. It has become, therefore, a matter of vital importance to us as dentists to try to eliminate this agent from the medical profession, or, to do as Dr. Weld has, give them something they can use without injury.

There is really nothing in this paper to antagonize, and therefore it is not readily discussed without taking up the entire subject; but there is one point I would like Dr. Weld in his response to reply to, and that is, that if this agent or preparation that he has made passes into the stomach and there undergoes a change back to hydrochloric acid, as I understand him to say, whether there was not a danger of possible regurgitation and secondary acid action on the teeth?

I was struck with the remark of Professor Elliot, that the saliva of animals will become acid by the use of certain still-slops. I remember a number of years ago, in the western part of New York State, where I was then residing, that I was brought in contact more or less with the animals that were kept at the distillery. Large droves of hogs were fed on the still-slops to the destruction of their teeth, and in a very few weeks these were entirely eroded, and that to such an extent as to be almost useless. I have noticed the same effect from still-slops in other directions. I do not believe, with Dr. Elliot, that the saliva of animals is ever acid, or at least if it is acid it must be on exceptional occasions. I go further than that, and am prepared to assert that human saliva is very rarely acid. I have not found it so in my tests of the secretions of the mouth, nor is it alkaline, but gives a neutral response. It was on that basis I was led to entertain the hypothesis that the oral secretions during the active period of the twenty-four hours, or during

the day-time, could not possibly act upon the teeth. I therefore determined to extend the testing to the period of absolute rest, or during the night, and it was my experience in repeated observations that the saliva during these hours gave an acid reaction.

Now, I agree fully with Professor Elliot in regard to the possibility of foods fermenting by being left in the mouth. If any one will test the mouth in those quiet places, such as cavities that are outside the active rush of the salivary fluids, they will find they get an acid reaction. I hope this preparation of Dr. Weld's will be adopted, but there seems to be in the medical profession a general antagonism to the opinion of dentists in regard to these matters.

Dr. Faught.—The subject is one in which I have been long interested from a personal relationship. While I wish to state the result of my observations here to-night, I do not cite these cases as being antagonistic at all, but it has been to me a matter of deep interest. I have had a great deal to do with the use of the ordinary tincture of iron in the case of my children. I do not find in their mouths, from its use through a period of years, any more, nor indeed as much, dental caries occurring as it has been my custom to observe in the mouths of other children. I state this because we have not taken precautions, for reasons of my own, as to the use of tubes or quills.

I have been in the habit for some time of taking medical care of my children to a certain degree. For a long period the older child has been subject to recurrent attacks of tonsillitis, which would occur through the winter-time. I painted the tonsils with tincture of iron in dilution of about half water, using it quite frequently, as often as the urgency of the case required. I have used it at all hours of the day and night, and have made free use of the iron internally, giving it in large doses up to the limit, and so with the youngest child for other conditions, but in no instance have I found the condition of the mouths show any evidence of undue breaking down or disintegration of the teeth. And I have not taken preventive measures. There may be reasons which overcome acid reactions, and perhaps the tincture of iron is very carefully prepared; I will say that it is not the tincture of iron ordinarily obtained from drug-stores, and it may not be quite so acid. I merely state these facts because it has been to me a matter of considerable interest and wonder, extending, as it has, through a period of years.

Dr. Weld, in answering Dr. Faught, remarked: Of course, when the modified tincture, so to speak, passes through the mouth into the stomach, it combines with more acid and is likely restored to its former

condition. The hydrochloric acid which it meets in the stomach is very small in quanity, and it could not be very much changed. My idea in speaking of that was merely to illustrate that after it passed the mouth and into the stomach its acidity would be increased rather than decreased, and that on account of that increase it would, perhaps, be more likely to be diffused through the system than otherwise. In other words, if we assume it was taken in the stomach, and instead of the acid increasing it should decrease, we would probably get precipitation. We would have an emasculated preparation of iron which would not be diffused. We know there are various preparations of iron which have been put upon the market, and a number of other preparations which are not easily changed when they reach the stomach.

One thing in connection with the chloride of iron is, that when it enters the stomach it is more diffusible than other preparations. As stated in my paper, physicians and practitioners have observed that it had a quicker and better effect than most all other forms of iron. Unfortunately, as you all know, we can get very few children, with, perhaps, the exception of my friend's children, to take that form of iron. It makes but little difference whether it is the children of the wealthy or of the slums or dispensaries. The poor woman says to the physician, "My child will not take that iron," and the wealthy woman's child objects in the same way, and if they take it, it is with a great degree of reluctance. Dr. Winters, a friend of mine in New York, is trying it in cases of diphtheria. He states that after it has been used a certain length of time it excites nausea and vomiting.

I wish to emphasize here a matter which I mentioned before the Odontological Society of New York; that is, that I believe the margin of the gums, as a rule, retains acid longer than any of the other surfaces of the mucous membranes of the mouth, forming a sort of sack that holds it, and that not infrequently if a piece of delicate litmus paper is put to the margin, you get the color indicating an acid present. If the mouth be thoroughly rinsed, there is no acid. If a little acid be taken in the mouth again, and the mouth be rinsed and the litmus paper applied, you get no acid; but at the neck of the tooth you have that reaction. I am not prepared to say at present whether the retention of acid at the margin of the gums can affect the teeth in any way. I have not studied it, but I think there is something in it worth Dr. Kirk's consideration. I am very sorry that that gentleman is not here, and especially so to know that sickness prevents him.

I do not know that I can add anything to what has been said. There are people who go through the world with iron constitutions, and are not affected by alcohol or anything else; and there are some children whose teeth are exempt from acid, and I am glad to know that that is the case with my friend's children. There are chemical laws governing the action of acids on carbonate of lime wherever it is, and the law is unchangeable. It will attack it at once, and all the washing you can do afterwards does not remove the first contact.

Professor Elliot.—I once made experiments with some enamel prepared for me from a large number of teeth,—twenty-nine, I think, the doctor said,—from different patients, and I found that a mere immersion in a weak six-per-cent. solution of acetic acid—simply dipping the enamel in and removing it—reduced the weight of the teeth eight per cent.

Dr. Dwinelle.—I believe the fact of the deleterious effect of hydrochloric iron upon the teeth has been known and recognized almost as long as medicine has been practised. I believe there is no doubt about it, although there may be exceptions to the rule; but the fact itself remains the same and impregnable.

Dr. Truman said he could not help admiring the courage of Dr. Faught in giving his children chloride of iron in the way he did, though the courage was not to be commended. If a microscope be used, it will be seen how little acid, it takes to dissect out the enamel,—one part in ten of water. The action of hydrochloric acid is readily seen in sections, cutting it away. It is the practice we have always adopted in dissecting out this tissue. Now, if so small an amount will do it, how could Dr. Faught use chloride of iron on his children's teeth *ad libitum*, without producing more or less injury to the teeth?

Dr. Faught explained that he had merely mentioned the case because it was of especial interest to him, and stated that any one who cared to see the children might do so.

Dr. Weld asked if it had been applied locally or systemically, to which Dr. Faught answered that it had been used in both ways. Dr. Faught stated, in answer to Dr. Truman's surprise that an intelligent dentist should use acid so freely, that he had the personal and careful and constant inspection of the teeth, and should have desisted at once upon the appearance of injurious effects.

Professor Elliot asked if he knew the origin of the tincture of iron used, stating that in the College of Pharmacy in New York he would frequently have people come to him and ask if preparations

they submitted were up to the standard, and that if Dr. Faught would examine the tincture of iron he had used he would be surprised at the strength. Tincture of iron should contain $7\frac{8}{10}$ per cent. perchloride of iron. Some tincture of iron is very mild as compared with others. Some almost fume from the excessive quantity of acid. Our friend may have gotten hold of some of the mild variety, and it might have been made by some conscientious druggist who prepared his own preparations, and who took care to reduce the iron.

Dr. Faught stated in reply that the iron he had used was procured in every instance from a personal friend,—one of the heads of a department in John Wyeth & Co.'s,—who prepared it for him expressly.

THE usual routine business having been transacted, the President. Dr. Jack, presented the essayist of the evening, Dr. C. N. Peirce, who read a paper on "Pyorrhœa Alveolaris due largely to Systemic Predispositions."

PYORRHŒA ALVEOLARIS DUE LARGELY TO SYSTEMIC PREDISPOSITION.

BY C. N. PEIRCE, D.D.S.

A FACT well recognized is that heredity and adaptation are important factors in the production and modification of organs as well as of organisms, and that when these are once established in harmony with a comparatively stable environment, they become so fixed that they are, through successive generations, reproduced with comparatively limited variations. So when deviations from the recognized forms occur, we may naturally look for the factor which has been instrumental in causing this divergence; and in doing so endeavor to place it, when found, either in the line of ancestral traits, in one of those modifications arising from effort of adaptation to a new environment, or to a new use or a disuse of the parts, or to the influence of some specific poison with which the patient or individual has been recently inoculated.

Though man, in his ancestral line, far exceeds the limits of definite knowledge, he is evidently still much younger or more recent in origin than many other mammals, but yet old enough to have become so fixed in his prominent physical characteristics that each individual of succeeding generations is hopefully expected to be not unlike the ancestral type. But, notwithstanding this hereditary and adaptive influence, there are constantly appearing local minor modifications, peculiarities, or abnormalities, which, wherever located, are such an expression as to interfere with either symmetry, function, comfort, or that economy for which nature is so constantly struggling.

The etiology of such abnormal manifestations is a matter of deep and continued interest and anxiety to the physiologist, as well as the pathologist, for to successfully anticipate, combat, or correct these unfavorable conditions, this knowledge of their etiology is of the greatest importance.

While, as above expressed, they are in position local, the inquiry

comes with much force, are they wholly due to traumatic influences, or are they the local expression of some systemic condition, and located in the special field or district, because of a predisposition of the tissues, structures, or organs involved? There are several such abnormalities to which reference might be made, but in order not to confuse the subject for this evening's consideration, one only shall receive attention at the present time, and that one in its progress and results is so familiar to you all that I need simply name it. The tissues involved are the alveolus, the alveolo-pericemental membrane, and the cementum of the root. And while the results of pyorrhœa alveolaris are so disastrous, yet it is usually regarded as a purely local affection, both in origin and influence. There are, however, some associate lesions usually accompanying it, so that it may, with a good degree of appropriateness, be estimated as being largely under the direction of a systemic predisposition. In recording the history of its progress I shall endeavor to note the evidence in favor of this theory. The structure of the dense tissues involved is too well known and appreciated to need repetition; but a few words regarding the soft or more vascular structures may not be out of place.

This tissue, with its blood-vessels and nerves, which connects the cementum of the tooth and the inner wall of the alveolus with the arterial and nervous systems we shall designate, as above, the alveolo-pericemental membrane; its office is regarded as functional, physical, and sensory, and it is so arranged as to closely invest the root of the tooth and fill the space between it and its alveolus; protecting the cementum of the root at times beyond the alveolar border up to its union with the enamel, and below the apical end to the limit of its bony surrounding. It is composed of fibres which are firmly fixed to the cementum and from that surface pass out in a slightly divergent direction, lying nearly parallel with each other, save the deviations which occur to give place to the blood-vessels, nerves, and lymphatics, to be embedded in the alveolus, and thus help to hold the tooth in position; osteoblasts which build up portions of the alveolar walls; cementoblasts which construct the cementum; fibroblasts for the augmentation or renewal of its fibrous tissues, and osteoclasts and cementoclasts for the removal of these tissues when stimulated by either physiological or pathological considerations,—all have a physiological importance. This membrane varies in thickness in different individuals, and in the same individual at different periods of life, or under different systemic or local conditions. The abnormalities to which it is liable are such as are

common to all vascular tissues, but are much exalted in severity and results in consequence of the membrane being located between two unyielding surfaces. This root-membrane Charles S. Tomes describes as a "connective tissue of moderate density, devoid of elastic fibres, and richly supplied with nerves and blood-vessels." The fact that the "principal fibres" run across from cementum to process without break in continuity demonstrates it to be but a single membrane, so that one for the root and another for the alveolus is not a feasible proposition. On its inner aspect, where it becomes interwoven with the cementum, it is pictured by histologists as consisting of a fine net-work of interlacing bands, which are firmly adherent to the cementum. This surface, it is alleged by Tomes and Black, is richly cellular, containing large, soft, nucleated plasm-masses, which are the cementoblasts for the formation of cementum, and which, by their offshoots or prolongations, communicate with vascular masses within the cementum. The vascular supply of this membrane is derived from three sources,—the vessels in the gums or soft tissue covering the alveolus, the vessels in the bone, and branches of the vessels destined for the pulp-supply, the last being by far the most important and especially worthy of note, as will be seen from a subsequent paragraph. So please keep in mind that the tooth-pulp and the tissue, which is now our root-membrane, receive their blood-supply largely from the same source. Blood enters the tooth-pulp in great abundance; the dentine through the tubules is also well supplied, and these tubules, by prolongations, connect with cement-corpuscles or lacunæ, and these again are, through a multiplicity of little canals and vessels, brought into close connection or intimate relation with the vascular membrane on the root. So between the pulp inside and the cemental membrane on the outside, there is in a normal tooth a continual interchange of living plasma, in addition to the supply which it receives from the vessels of the gum and alveolus. With this brief description of the alveolo-pericemental membrane, the tissue, the abnormal diseased condition of which is under consideration, we proceed to the origin and progress of its deviations from health. Dr. G. V. Black has very appropriately given us two terms to express the pathological conditions which are now known as pyorrhœa alveolaris, or "Riggs' disease," gingivitis, or *phagedenic pericementitis* and calcic inflammation, or better, *calcic pericementitis.* Pyorrhœa alveolaris simply expresses a flow of pus from the alveolus, and could as well be applied to acute alveolar abscess as to these chronic conditions. Of the two conditions designated by Dr. Black, it is our

purpose to speak of one only,—*calcic pericementitis.* Gingivitis or phagedenic pericementitis may or may not be a systemic expression, though it would be quite safe to so regard it; while the other, calcic pericementitis, is regarded by many as a purely local affection, and yielding, if at all, to local treatment only. To those holding such views let one inquiry be made. Are renal and hepatic incrustations or accumulations to be regarded as wholly the result of abnormal conditions of the liver and kidney, or are they not rather due to some systemic condition wherein nutrition, appropriation, absorption, and waste are involved? Is it not a process of transformation, which is characterized by the deposit in these tissues or organs of various salts derived directly from the blood? We all know that calcareous deposition takes place in special localities or organs as a normal physiological process, as in the formation of bones and teeth; but when found in excess, or from these fields it is diverted and elsewhere deposited as an amorphous salt instead of an organized structure, and with a truly pathological result, shall it be stated with any degree of consistency or wisdom that the localities receiving it are the only unfaithful or treacherous members? I trust not. There may be foreign substances, living or dead, necrosed particles, trichinæ, shot, etc., which are sources of irritation, and which, for the protection of surrounding tissues, may become encysted. We may also have excementosis persistently progressing to the extent of greatly enlarging the transverse diameter of the root, but in such cases there is a local stimuli sufficient to excite the cell and call into play its power of multiplication without seriously disturbing its function of reproduction; but these instances are widely different from renal and hepatic depositions, as well as from the serumal deposits upon the teeth, all of which, though only precipitates, at times become so extremely hard they cannot be cut with a knife, and yet they are only an amorphous or unorganized salt. Hepatic depositions rarely occur before middle life; out of four hundred cases collected by Hein, less than four per cent. were under twenty-five. The same could with truth be said of serumal deposits on the teeth, the larger proportion of cases showing no manifestation until after the age of forty years.

Morbid changes in the secretions, sedentary habits of life, errors in diet, are noted by Fried. Theod. Frerichs as being favorable to the formation of gall-stones, while a calculous diathesis is spoken of in connection with both urinary and biliary calculi. Ziegler, in his work on pathological anatomy, says, "concretions of calcium phosphate and carbonate deposited in the kidney constitute what

is called calcareous infiltration." "It occurs chiefly in aged persons in whom resorption of the bony structures is active; but it may occur without such resorption."

While we recognize that biliary and urinary deposits are not identical in analysis with serumal or sanguinary deposits upon the roots of teeth, yet the urinary have in common with the serumal or sanguinary deposit a marked concomitant, "a calculous diathesis," and not infrequently where the former urinary deposit is recognized the latter is also found.

In over seventy-five per cent. of the cases of calcic pericementitis under my care,—and I have had, and now have, a large number, —induration of tooth tissue has preceded serumal deposit.

This *antecedent* is to me an important feature in the diagnosis and prognosis of the case. This filling up of tubuli and reduction of pulp-chamber and canals establishes the diathesis, and at the same time necessarily reduces very materially the blood-supply to the pulp, and, in consequence thereof, places the pericemental membrane for the time in a hyperæmic condition. We have already admitted the intimate blood-relation existing between these two vascular tissues. This change of tooth-structure we recognize as the first physical deviation from normality, with subsequent ones depending upon predispositions due to inherited or acquired tendencies.

This second deviation from normality we now recognize as occurring in the alveolo-pericemental membrane, and we designate it as a hyperæmic condition, showing itself visually and mechanically. To the eye there is more or less reddening and turgescence on the gum, irritation of continuity, while the tooth itself is, in many cases, perceptibly elongated to give room for the congested and necessarily thickened membrane from the dilatation of the blood-vessels of the part and their repletion with blood.

This hyperæmic state may be described as being either active or passive; but in the conditions under consideration we shall, from results, assume that it was first active, inasmuch as we have an increased flow of blood to the parts inducing congestion, and passive to the extent of a reduced or diminished flow of blood from the part producing engorgment, over-distention of the vessels, to be relieved only by exudation; this increased quantity of liquid plasma transudes under pressure from the vessels. Let it be here recognized that this transuding plasma is that portion of the blood which carries the mineral element, the accumulation of which on the cementum of the root is at once patent in response to both its source and to its unavoidable presence. I repeat, unavoidable, for this

transudation from the blood, with its calcic freight, is far in excess of the capacity of the lymphatics to carry away. So, from stasis of the blood we have stasis of lymph, with a saturation of the surrounding tissues far in excess of the normal degree. Shall we term this an œdematous condition, œdema of engorgment? Collateral œdema it is, for it is the effect of some previous condition.

Inflammation is now localized and present in full force,—redness, swelling, heat, and some pain, with a marked impairment, and in some cases the total arrest, of the function of the tissue involved. The conditions established are vascular disturbance, disordered nutrition, an accumulation of exuded plasma, an arrest of function, and a precipitation of calcic crystals in the shape of an amorphous salt on the surface of the root, which, while remaining in this position, reacts so as to exalt and continue the inflammatory condition. Now, what shall we consider the primary *noxious* element which causes an alteration in the vessels, disturbs or arrests their normal function, and excites inflammation? Is it possible that this injurious agent is brought to this locality in the blood itself? Can it be that this calcic material, which was first appropriated in solidifying the tooth, is now increased in such quantity as to be the cause of these clogged and altered vessels and of other conditions which are doing such irreparable damage, or is it only a sequence? To ascertain a correct explanation of these abnormalities these inquiries are made. One concomitant of it all must certainly be admitted, the presence of a "calculous diathesis."

Another, and not the least important, condition is yet to be noted. The exudation has reached or assumed a purulent form,—a whitish, milky, or yellow appearance,—and is now called "matter," or pus. This change has doubtless been through the influence of bacteria, infectious micro-organisms. The tendency of these organisms is to increase the breaking down or dissolution of the tissues, so that we now have formed a pus-containing cavity—an *abscess*—a *pocket*—from which, if without treatment, pus is continually discharged until the tissues are destroyed and the tooth drops out, or, to relieve discomfort, is artificially removed. In some instances, when left unattended, exudation undergoes putrefaction, and is offensive. The staphylococcus (so called from being in close cluster, like grapes) thrives, says Carl Frankel, at ordinary room-temperature, but multiplies far more luxuriantly when at a higher point. It *is not* a harmless concomitant of purulent inflammatory processes, as has been demonstrated by successful transmissions; these experiments proving without doubt its septic character.

We have given, as far as possible, a history of the origin, progress, and termination of calcic pericementitis, or pyorrhœa alveolaris, so termed.

The reasons for estimating it as being associated with a systemic predisposition are,—

First. It has invariably, as an antecedent, a calculous diathesis.

Second. The age at which it becomes manifest is in correspondence with similar renal and hepatic affections, rarely being under forty years.

Third. When treated to a comparatively successful termination, it needs constant watchfulness and care, else a few months will see it as active and virulent as in any previous stage.

Fourth. While under proper and efficient care with marked satisfactory progress, systemic disturbances with a limited period of neglect will not only retard repair, but will greatly exalt the inflammatory condition with all its accompaniments.

Fifth. Never is one tooth alone the victim of the disease, but organs on both sides of the mouth, as well as in both the inferior and superior jaws, extending ofttimes to the whole denture, are probable victims; and when once located on any tooth, not one in the mouth is free from the possibility of attack at a near or remote period.

Sixth. The great frequency at which it can be traced directly to an ancestral influence; fully ninety per cent. are of this character, and I deem it one of the strongest evidences in favor of its being the result of a constitutional condition.

Seventh. Ordinary salivary calculus may be present to a greater or less degree, even to the complete visual obliteration of all the teeth in the mouth; but when this is thoroughly removed, the trifling irritation at the gingival borders yields at once to the application of appropriate remedies, providing the serumal or sanguinary deposit is not present.

The treatment to be pursued is too familiar to the profession to need repetition.

DISCUSSION.

The discussion was opened by Dr. Truman: I take issue with Professor Peirce directly as to the origin of Pyorrhœa Alveolaris. He lays great stress upon serumal tartar. I am not aware that any one has yet demonstrated absolutely that there is such a deposit from the blood or serum upon the roots. It seems to me to be largely pure theory. We are all familiar with the depositions that may be made in all parts of the organism, and it is very possible

that it may occur upon the roots of the teeth. I do not antagonize this supposed fact, but simply affirm that it has not been, in my judgment, demonstrated. Dr. Ingersoll was, I believe, the first to call attention to this tartar and its possible origin, giving it the name. If serumal tartar exists, admitting that it is present upon the roots of the teeth, what is the effect? Dr. Peirce asserts that it is primary; I entertain the view that it is secondary in its action. If I understand the origin and progress of this disease, it begins first by irritation. We find, in its minor manifestation, inflammation around the necks of the teeth, the red line indicating congestion at the marginal border, with hemorrhage upon the slightest touch.

I regard this as the beginning of this pathological condition; this necessarily becomes pyorrhœa by the increased development of pathological germs, and these I regard as the primary cause of this disturbance. When the histological conditions that exist around the necks of the teeth are considered, there will, I think, be agreement with me that the evidence is clearly made out that after the irritation is produced at this part, the development or increased development of micro-organisms takes place, and the waste products produce inflammation of the pericementum. But it is not, in my judgment, that irritation is produced by the deposit named, whether this be called salivary or serumal tartar. That it is secondary must be clear to any one who has carefully examined the condition of the pockets formed in this disease, and that irritation of the pericementum precedes that produced by the calculus present.

And again, I take exception to the fact that the deposit exists in all cases. If this were so, it would seem impossible that we should have the destructive effect which we know exists. Tartar is found in large quantities elsewhere on the teeth, but beyond producing resorption of the tissues, there is none of the usual phenomena accompanying pyorrhœa alveolaris. The absence of activity in the germ element is most noticeable; indeed, I regard the presence there in injurious numbers as an impossibility.

I must also disagree with the essayist as to the age of patients. I have had many patients with pyorrhœa that were quite young, with teeth comparatively soft. It must be admitted that it is largely a disease of middle age. My own view of the matter is that pyorrhœa is mainly local, and that it may be governed by systemic conditions which aggravate it; but if we can cure or relieve the local manifestation, the systemic will take care of themselves, so far as this disease is concerned.

The question has been raised in Professor Peirce's paper whether in the treatment of pyorrhœa alveolaris we can restore the tissues separated from the cement. It is well known that in the implantation of teeth we have reformation of bone around the tooth holding it in place. In pyorrhœa, ordinarily the pockets remain, and it becomes a difficulty as to how these are to be treated in the future, after we bring about a healthy condition. Nothing but the continual use of antiseptics will obviate this, and by their use it may be possible eventually to have redevelopment of bone. In any event they must be used, or there will be a recurrence of the disease.

The possibility of infection will depend on the transfer of irritation from one tooth to another and the continued development of micro-organisms in the new locality.

I had an interesting example of reformation of bone around teeth subsequent to treatment in this disease the present week. I treated the case over a year ago, and had no expectation that this would be satisfactory, as several of the roots were exposed almost the entire length; but during the intervening time the case was thoroughly cared for antiseptically, and, when examined, I found that, with one exception, tissue had formed closely around the margin of the gum, and the teeth were perfectly firm and healthy. This seems to show that these pockets can be filled up with osseous tissue.

Dr. Brubaker.—The pathological process alluded to might throw some light upon the change around the tooth. If I understand Dr. Peirce's position, there is a deposition of some sort of lime in the pericemental membrane, and that this deposition, by its presence and irritation, is the immediate cause of the flow of pus. Whether the deposition upon the roots is of the same character as the salivary calculus I do not know. There is just a possibility that the deposition, as shown by some of the teeth, is an oxalate of lime instead of phosphate. The doctor assumes that the deposit of calcareous scale is a result of either abnormal conditions of the blood-vessels, or some disorder of the general nutrition.

In urinal troubles it is well known that in the case of children of three or four years of age, there is a deposition of oxalate of lime which forms, and, being retained in this locality, it excites irritation and develops pus; and we may have here then a condition of pyorrhœa similar to that around the teeth. This deposition of oxalate of lime might be the result either of changed condition of the blood-vessels or of change in the nutrition, and this deposition is also hereditary.

The deposition of oxalate, or any salt, in fact, always takes the

line of least resistance. There is the condition which has been described as an oxalate of lime diathesis, which has many similarities to uric acid diathesis. If you take that condition, it is accumulated in the body as some disorder of nutrition. In one it is a deposition around the toe; in another around the joints of the finger and thumb; deposit in the ears or stomach; or it may be a deposit in the throat, according to the peculiarities of this or that individual. These may be only analogous to conditions around the teeth, and may not be at all similar; notwithstanding, I think it should be looked at from that point of view as being constitutional in character, and if that particular scale deposit on the teeth is oxalate, it would go very far to prove that it was not local in its origin, but that it comes from the blood as a result of general disorder of nutrition.

Dr. Peirce.—I would like to say a few words, not in answer so much as to correct a wrong impression. I thought I stated that I wanted my paper to be considered as treating pyorrhœa where it came from a deposition on the root of the tooth, called serumal or sanguinary deposit.

I have three molars in my hand which I have taken out quite recently, all coated with a hard cement on the end or near the ends of the root, from a mouth where all the teeth have been more or less affected, but these were extracted before the patient came to me, and the deposit is confined to the root of the tooth. It was simply of that phase of which I wanted to speak in the paper.

I agree with Dr. Truman that where it occurs without the presence of serumal deposition, it commences at the margin of the gum; but where it comes from what has been termed serumal deposit, I am satisfied from my experience the irritation will start at the end of the root without any connection whatever with the cervical border, and from that point it works upward.

Dr. Darby.—First of all, I desire to congratulate the essayist upon the fact that he mentioned the name of Dr. Riggs but once in connection with the disease under consideration. We have better names than "Riggs' disease" for this condition.

I never think of his method of treatment, nor look at the instruments which he designed for the purpose, that I do not shudder, for I consider his method cruel, and in most instances futile.

I think Dr. L. C. Ingersoll was the first to denominate the deposition at the apex and along the side of the root sanguinary calculus. Possibly Dr. Black adheres to a better term when he calls it serumal calculus. It is unquestionably from the blood.

The essayist has spoken of the constitutional and hereditary origin of this disease. I can remember when it was nearly always regarded as a constitutional if not an hereditary one, and I am not sure now that the tendency to such a condition is not of this character. I will not be quoted as having said that because one or both parents have suffered from pyorrhœa alveolaris, their offspring will do so, but there have been so many instances brought to my notice where persons have said to me, my father or my mother lost their teeth in the same manner, that I am sometimes led to believe in this theory.

Professor Truman's experience is in harmony with my own observation, that the disease does not often manifest itself before middle life, and yet I have seen well-defined cases of it long before. I recall this moment a young lady in whom it appeared in a very pronounced form as early as the nineteenth year, and at twenty-six or twenty-eight she had lost all of her inferior teeth except the two wisdom teeth. I saw but yesterday a very marked and sad case of this disease. The lady had been a patient of mine for more than twenty years. Her teeth were unusually good, and she had always bestowed upon them the best of care. She has been spending three or four years in Germany and has just returned to America. My surprise was great when looking into her mouth to find all of the six anterior superior teeth elongated, loose, and pus flowing from the gingival border upon the least pressure. She, too, supposed the disease an hereditary one,—for, said she, my mother lost her teeth in this way when she was about my age.

My observation has been such as to lead me to agree with the essayist in his belief that the disease does not usually begin at the gingivæ, but at some point along the root. I am quite sure that I have seen more cases in which the disease began high up on the root than otherwise. The serumal deposit is, in my opinion, one of the sequences, and not one of the causes, of the inflammation.

Dr. Truman.—Dr. Peirce stated that it was not confined to one tooth. I can give an illustration in my own mouth. Twenty-five years ago I had one tooth that was affected, and treated without any success with chromic acid. I eventually relieved the difficulty, but it never extended to the adjoining teeth.

Dr. Rehfuss.—I have nothing especial to say upon the subject. I think with Dr. Truman that the cause of the disease is not always constitutional in its origin. I can cite in my own practice a number of cases; particularly one in which the disease had progressed and involved three teeth of the lower jaw,—two central

incisors and the right lateral. In this case I had the attending physician make a thorough examination of the patient as to constitutional troubles, involving an examination of the urine and the most careful observation otherwise. While I cannot say definitely in this particular instance that it was not due to systemic troubles, still it led me to believe that such was the case. I discovered that there was a serumal deposit, but only half-way down the root; there was none at the neck; the formation of pus naturally followed, and the treatment I found brought about a normal condition of the gums, that proving to me that in this one instance it was one purely of local origin.

As to constitutional causes, a number of our best writers are agreed, as Professor Peirce has stated, that in the majority of cases it is due to urinal troubles. In this line, my investigations have not been as deep, of course, as those of the essayist, but one case in particular I can cite in which the patient had urinal trouble. I can state that it was not positively proven to my mind that the pyorrhœa alveolaris was of constitutional origin, due to this genito-urinal irritability, though there was a serumal deposit on the roots.

It seems to be a vexed and unsettled question in the profession as to whether pyorrhœa alveolaris is of constitutional or local origin. As Dr. Truman stated, constitutional troubles excite or increase the disease.

Dr. Jeffries.—I don't care to discuss the scientific points brought up for consideration. I have a case in mind that I would like to speak of, illustrating the fact that they are not all middle-aged patients,—one under treatment where each of the anterior lower teeth were, I think, in about the worst condition I ever saw. The gums were very much congested, teeth loose, and an instrument could be passed half-way down the roots. There was a marked depression on the lingual surface. The teeth were forced, by occlusion of the under teeth, probably one-eighth of an inch out of the arch, making it prominent and very unsightly, but by treatment with aromatic sulphuric acid, after removing the calculi, the gum healed very nicely. The right superior central had to be brought into line and held there with a gold band.

Dr. Head.—I desire to inquire of Dr. Peirce if he has ever seen any specimens where these deposits were found upon the teeth and did not appear at the neck? In these two specimens they are extremely interesting; it is true, the larger quantity is well below the margin of the gum, and there is a distinct line from the gum

down. As regards the age, fully one-fourth of the cases which I have had have been less than twenty-eight years of age.

Dr. Peirce.—I have a great many cases where they were evidently, in the inception, at the apical end of the root, having no connection with the neck of the tooth. Calcic pericementitis involving at that time the end of the root only, as the exudation increases, it must find some exit, so it works out towards the border. The disease, as it progresses, must find an exit for the exudation at the root, and it finds it easier by working up and out at the gingival border than in any other way.

Dr. Head.—If the germs are found at the neck and at the end of the teeth, is it not difficult to tell where it starts?

Dr. Peirce.—I have seen many specimens where I know the commencement of this disease was at the end of the root. In its progress it made its way up to the gum-line.

Dr. McQuillan.—I would like the gentlemen present to tell their success in treatment. I consider I have bridled it to a considerable extent, but never made a cure of it; and after working as conscientiously as I know how and getting the mouths in fairly good condition, I find they come back in six months or a year, and then there is a slight recurrence of it, but I would like to know whether those present have had many cures. It always seems to me that a case of pyorrhœa means a continuous fee for the dentist. I always try to be very careful and keep up the treatment; not with that end in view, however, but to help the patient.

Dr. Neal.—I have a patient forty years of age, who I know or believe is perfectly healthy, but the right central is much affected with pyorrhœa alveolaris; the lateral is loose and projecting, and the adjoining tooth is also affected on the right anterior surface, and in each case the disease is confined only to one portion of the tooth. Pus issues from the gum. I treated it with disinfectants, and particularly phenol. I think the phenol has been of great advantage, better than hydrogen peroxide; but I am not able to cure it. The patient has been coming to me for a year or two. I am at a loss to know what to do or how to proceed. He is a man very careful, and would not lose a tooth for a great deal of money. I told him I could possibly succeed in getting the gum to unite with the tooth where it has receded. Am I correct?

Dr. Deane.—I am very glad there are so many here to-night who can help me out on this question. I entertained the idea a few years ago that I could cure a very difficult case, but I found the

patient was worse off after treatment than before. He told me his mother had lost her teeth before she was thirty. All his teeth, without exception, are affected. He does not come as regularly as I would like to see him, and when he does, pretty nearly every tooth is bathed in pus. I have succeeded in keeping them in by using peroxide of hydrogen and iodine. I wash them out as well as I can and then inject iodine with a Lewis syringe, and in that way have been able to keep the teeth in his mouth, but they are not of much value to him.

Dr. Peirce.—I felt when I read the paper it would be very difficult to discriminate between irritation commencing at the gingival border and that at the end or side of the root; I wanted to discriminate between the two, and wanted my paper to apply to but one only. There is a different condition, though yielding probably to similar treatment; in both, pus and bacteria are present.

Now, so far as treatment is concerned, if I give you one typical case it will cover the ground.

About three months ago a physician in the neighborhood came to me. He is about forty-three years of age, and on looking at his mouth I was, to say the least, surprised. There was not a tooth from which there was not exuding pus, and he had thirty-two. I handed him a tumbler with a little peroxide of hydrogen, and asked him to rinse out his mouth. He washed it out repeatedly until he had it quite clean. I made an appointment for him a few days later, when I could give each tooth attention. He came at the appointed hour, and I took my scalers and went regularly around the mouth, removing the tartar as well as I could, and then applied to the gums some aristol rubbed up with gaultheria. I put it down in the pockets with a little spatula I had made from a small excavator which I had flattened at the end, so I could work it to the bottom of each pocket, and then painted the gums externally around the mouth with tincture of iodine. He wished me to see his mother; that she was seventy-five or seventy-six years of age, and was affected in the same way. She came in the course of a few days. The gentleman came back by appointment in about ten days, and I then repeated the treatment,—very similar to the first,—washing out each pocket with peroxide of hydrogen and then washing the mouth, to clear it of pus, and made an application in the same way with the gaultheria and aristol. Of course, on the second visit the gums were in very much better condition, as they had healed. The application of the remedy was successful in reducing irritation. I have had five visits from

him at this time, and all his teeth have improved perceptibly; and though in better condition than they were, I cannot encourage him that his mouth will ever get well, yet I informed him that if he will keep the teeth under treatment for years, I have no doubt they will be saved, but only by constant care; to let them go five or six months without attention would be destructive to them.

The mother came in by appointment. She had lost two molars of the right side, inferior and superior, and one on the left; the remaining were somewhat loose, the bicuspids were quite loose, and the anterior teeth all had little pockets. I treated her the second time; her mouth is in a much improved condition. I never saw a more rapid and marked change in the mouth of any one. The two first molars are the only ones I fear losing. The others have healed, and while the pockets are there, there is no exudation; but I told her she will have to come every two months, as that is the only way she can keep them.

There was a little tendency in the son to salivary deposit, but the free use of oranges abated it; but on the necks of the teeth there was irritation on the cementum on nearly every tooth, but whether that was due to the frequent use of oranges I could not say. It may have been only a concomitant and not the result. When he first visited me his teeth had given him considerable pain, but after the first treatment he had none.

In speaking of gaultheria and aristol, I have a preparation that I like, because I can make up a quantity of it and have it for use. I take the aristol in a wide-mouthed bottle and put in equal quantities of tincture of iodine, oil of gaultheria, oil of cinnamon, and carbolic acid. It has an advantage over gaultheria and aristol. It is not gummy; the iodine cuts it and makes it creamy, so that it can be readily used, and it remains without change for days or weeks. I like the preparation, and have used it for some time.

Dr. Luckie asked what would be the result of a patient using Buffalo lithia water, stating that he had been asked the question by a patient, and he replied that he did not know.

Dr. Darby.—I do not think my method of treatment is unlike that of many others. I have been using of late, with much satisfaction, "Dr. Robinson's remedy," which consists of carbolic acid and caustic potash, and after the manner suggested by the gentleman whose name the remedy bears. It is simply to remove as much of the deposit as possible, and then pack into the pockets cotton saturated with this remedy. I have seen some wonderful changes

brought about in a few days by one or two applications made as above indicated. I leave the cotton in the pockets as long as it will remain, which is usually two or three days.

Dr. Deane.—In speaking of instruments, I would like to suggest that the ordinary quill tooth-pick can be satisfactorily used by splitting off half an inch of it and inserting it in an ordinary nerve-broach carrier. With it you can carry medicine up the side of the tooth nicely. It goes almost up to the apex, because you can shave it down and use a pumping motion, which carries the remedy up the side of the tooth by capillary attraction; after using it can be thrown aside and another made.

Dr. Luckie.—I would ask what effect the destruction of the pulp would have? Dr. Peirce has spoken of the dentine filling up during the progress of the disease, and I would be pleased to know if devitalization of the pulp would have any effect in changing nutrition from the pulp, if it was diverted to the peridental membrane. I am treating a case where I intend to fasten all the teeth together. There has been considerable abrasion of the teeth, and the cusps of the bicuspids are entirely worn away; the remaining teeth it is my intention to devitalize. I would ask to have the opinion of the doctor on that method of treatment.

Dr. Peirce.—I remember Dr. Garretson coming to me some ten years ago and saying his method of treating it was to devitalize the tooth; he then made some further experiments, and a few months later reported that he had not had the satisfaction he had anticipated from this method. I don't know of any other one who ever tried it. That is all I know of the matter. I never attempted it myself, but don't think it would be beneficial.

Dr. McQuillan.—The worst case I have had in my practice is one that has been in my hands for fifteen years, and my father's for twenty-five. I have seen the patient every six months. About five years ago there were signs of pyorrhœa, and it has been very difficult to save the tooth; the disease has progressed rapidly.

I have used Dr. Robertson's remedy as mentioned by Dr. Darby, and have found most gratifying results from it; and also where I have an intelligent patient I also give them a preparation of chloride of zinc, six or eight grains to an ounce of rose-water, and tell them to paint the gums with a camel's-hair pencil once or twice a week. I have found considerable benefit in that direction.

Dr. Jack.—I have little that will add to what has already been said. I would speak of one case where I tried successfully to retain the teeth, where the disease had occasioned but slight

separation of the softer tissues. We may be able to preserve them for a considerable length of time, and yet where deeper pockets have occurred, in consequence of the longer-continued disease, the obstacle in the way of amelioration would appear to my mind to be due to the fact that it is impossible to produce a state of permanent cleanliness in the pockets, they being filled with the *débris* of substances in mastication, and also by exudations that cannot by any means escape.

Dr. Rehfuss.—My method of treatment does not differ possibly with that of other practitioners. I first remove all deposits, if there be any, on the roots of the teeth, and wash them out, using permanganate of potash or hydrogen peroxide to get rid of all pus, and then I have recourse to massage, possibly after my second treatment. I use three forms of massage; following this I use a paste of aristol or iodoform or iodol,—either one of the three in connection with oil of cassia,—and place it in the pus pockets. I find massage treatment very beneficial, but it must be very gentle at first.

I wish to say that Dr. Mills, of New York, has experimented with massage in pyorrhœa alveolaris since I first brought out my papers on the subject, and he claims he has much better success than he did before using it.

On motion of Dr. McQuillan, the thanks of the Society were extended to Dr. Peirce.

Adjourned.

THE usual routine business having been transacted, the President, Dr. Louis Jack, presented the essayist of the evening, Dr. Edward C. Kirk, who gave as the subject of his remarks, "Alveolar Abscess."

ALVEOLAR ABSCESS.

BY EDWARD C. KIRK, D.D.S.

MR. PRESIDENT AND GENTLEMEN,—I am compelled to preface my remarks with an apology for not presenting to you a formally-prepared essay, as I have been unable from lack of time to go through the mechanical work of writing a paper; so I will ask your indulgence while I speak from my rough notes.

It would be entirely superfluous to bring before this audience a description of alveolar abscess, as we meet it ordinarily. The clinical expressions of alveolar abscess are well known to all of us, but there are some forms of this disorder that occur infrequently, which have a special importance because of their possible fatal termination; and as the methods of treatment which we should adopt in cases of this sort are so entirely different from those which we ordinarily pursue, it seems not only worth while, but necessary, that we should be able to recognize them from their clinical expression in the very first stages.

Alveolar abscess, you know, starting as an acute attack of local inflammation, runs through a period of from twenty-four hours to a week, which may be required to bring it through the stage of pus-formation. I refer now to the class of cases where we have a large collection of pus, which is of a creamy, yellow character, which, when this is once evacuated, so far as the acute stage is concerned, rapidly subsides. That is what I recognize as the ordinary form.

About two years ago I was called to see a patient, at his house, suffering from alveolar abscess under rather peculiar circumstances. He had been for eighteen months running down in health; his special disorder was a profound nervous prostration, or neurasthenia. The nervous trouble had been progressing until his life was despaired of, but he had been slowly rallying from this. His disorder ran through a period of nearly two years from its inception to termination. It was during this time that I was called in to relieve him of pain in one of his molar teeth. I found a lower sixth-year molar on the left side presenting the symptoms of

alveolar abscess as we ordinarily understand it. The seat of inflammation was about the anterior root. He was confined to his bed, greatly prostrated, and, of course, my efforts at treatment were necessarily limited by the man's broken-down condition and my inability to properly get at the seat of the difficulty with remedies, owing to the lack of proper appliances for the treatment of such a case by the usual methods in the office; however, the inflammation ran its usual course, and in three or four days the sack was evacuated by lancing, he was relieved, and rapidly recovered from the effect of the attack. The cavity was on the mesial approximal surface, and there was ready access to the pulp-chamber. All I was able to do at the time was to sterilize the nerve-canal and pulp-chamber with tincture of iodine; the tooth was stopped afterwards with gutta-percha, after the canals had been filled with a paste made of hydronaphthol and eugenol.

The long period of his illness made it some months before I saw the patient again, though he came to me as soon as he was able to be out. I examined his teeth and found some slight carious places that needed attention, but overlooked this sixth-year molar, as it was absolutely comfortable, rendering him good service, and had all the appearances of a perfectly healthy, pulpless tooth. The only peculiarity was that the tooth was slightly raised at its mesial aspect, probably from the deposition of plastic material about the apex of the anterior root of the one which had been affected; otherwise the tooth was, to all appearances, healthy. There was no inflammation of the adjacent soft tissues, and no pain. His health became much better, he was able to attend to his business, and was seemingly on the high road to health. Last July he spent the Fourth at Atlantic City, and had "taken cold," as he expressed it. He returned on the 5th or 6th, and came to me complaining of pain in the region of the same tooth that I had treated the year before. I immediately inspected the tooth and found some portions of the paste remaining, but apparently disintegrating, and it was altogether in an unsatisfactory condition. On the border of the inferior maxilla, on a vertical line immediately below the tooth, was a small inflammatory bunch, which was quite dense and hard and attached to the bone, apparently, and immovable. The patient was suffering considerable pain at the time, though an examination showed no inflammation of the soft tissues surrounding the tooth. It was but slightly sore on pressure. The sixth-year molar above had been lost, and considering the critical condition of the man's nervous system, together with the location of the inflamma-

tion, which was considerably outside the region of the mouth, I reasoned that if pus had to burrow its way back into the mouth, it would take a long time, and that he was not in a fit condition to undergo the acute suffering that would be entailed. I therefore advised him to have the tooth removed, which was done by Dr. J. D. Thomas, under nitrous oxide. The next morning, after the removal of the tooth, the patient presented himself for inspection. I found the inflamed area somewhat enlarged, but only slightly, and I attributed it to the irritation caused by the extraction of the tooth. The socket contained two pledgets of cotton, which had been saturated with phénol sodique.

I inquired whether there had been any flow of pus following the extraction of the tooth. He said there had not, nor had Dr. Thomas observed any. I assured him of my belief that the extraction of the tooth would remove the difficulty, and he would soon feel better. The socket was washed out, and cotton with phénol sodique was reapplied. The next day I was sent for by the patient, and found him at his house confined to bed, having had a very painful and restless night suffering from a chill, and again presenting symptoms of profound nervous depression. The inflamed area had enlarged considerably, the skin was tense and glistening over the lump. Examination of the mouth revealed entire absence of inflammation of the soft tissues within the oral cavity. Taking into consideration his general condition, the symptoms indicating where the abscess was tending to form, it became very clear to my mind that to try to establish an exit of pus within the mouth would be dangerous or fatal in his case, because of his lack of vitality and the length of time that would necessarily be required to evacuate the pus from within the mouth, so I decided to poultice the swelling and establish the exit of pus from the outside. He was given tonic treatment, stimulants and quinine, and some morphia to relieve the pain. I then prescribed flaxseed poultices for twenty-four hours, at the expiration of which I found the swollen territory considerably enlarged, involving by this time the whole cheek and down the neck, nearly to the border of the clavicle; the skin had become copper-colored, and the whole surface was hard and tense and the patient very much exhausted from pain. No part of the surface seemed soft,—no place where a most careful examination showed pus to be determining. There seemed to be nothing to do but continue the application of poultices, which was done until the next morning, when by a careful examination with the index finger of the left hand in the mouth, and by careful palpation with the fingers of the right hand over

the inflamed area in every direction, I found one small spot about a half-inch in diameter, where there was a slight pulsation observable. Into this I passed a lancet and carried its point to the free border of the inferior maxilla, immediately below the position of the roots of the affected molar. This was followed by a very slight exudatian of pus, just enough to bring out on the knife-blade. The exudation was of a peculiar character,—glutinous, sticky, and albuminous in appearance, streaked with blood, and only a very slight amount of pus as we usually see it, that which we know as the laudable pus ordinarily evacuated from alveolar abscesses. Poulticing was continued constantly, and the constitutional treatment kept up. The discharge continued of the same character,—slimy and glutinous. The cavity made by the incision was washed with an antiseptic of phénol sodique in the proportion of a tablespoonful to two-thirds of a tumblerful of warm water. This gave some relief, but he was still suffering intensely from pain; the constitutional disturbance was very marked, and was out of all proportion to the pain he was suffering. The even character of the surface of the inflamed territory, which had characterized the condition up to date, now commenced to take on another form: there seemed to be centres where suppuration would present some three or four of them, giving it a hilly or boggy appearance, the surface appearing quite irregular. About four days later, after continued poulticing, a centre of suppuration formed about an inch and a half above and back of the first. This, in course of time, was opened and evacuated. Neither in washing it out nor by exploring with a probe was I able to detect any connection between the two openings. In the course of a week another centre of inflammation suppurated, which was still higher up, just below the ear. This was evacuated. By this time the two original pus-cavities became united, so that I could pass antiseptic solutions in at the second opening and out through the first. The jaws all this time were quite fixed, the patient being unable to open them more than an eighth or three-sixteenths of an inch; his throat was also very much swollen, and he had, so far as I could determine, all the physical signs of tonsillitis. The throat seemed to be closing up, so that it became almost impossible for him to swallow. I watched very carefully to see if there was any discharge of pus from the inside, but this did not occur, as far as I am aware. Later on, another centre of suppuration occurred upon the neck, about two inches below the border of the jaw. This was evacuated in the same way as the others. By this time the original opening com-

menced to heal, and there was a noticeable turn for the better. His general appearance was improved, and it was evident that the inflammation was subsiding. This state of affairs continuing, he was sent away to a summer resort, and during the summer his health returned to about normal. There was still some discharge at the first of September from the original opening, but the others had healed up. I saw him in October, and there was at that time a slight periodical discharge from the original fistula.

By this time he was able to open the mouth normally, and I made a careful examination. You will recollect that the sixth-year molar had been extracted; the second biscuspid was a pulpless tooth. I knew that to be in good order, as it was perfectly filled and gave no trouble. The twelfth-year molar up to the time of the first attack of alveolar abscess had been vital, and it presented all the appearances of a vital tooth at the time of my last examination in October. However, on the buccal side of this twelfth-year molar there was a fistulous opening, and extending from it was a red line along the gum to a point about opposite the position of the sixth-year molar which had been extracted. I suspected from this that pus had burrowed along under the gum-tissues, and had found exit at the fistulous opening alluded to alongside the twelfth-year molar. I did not suspect that the twelfth-year molar was devitalized, as it was without a cavity or any defect. Had my suspicions as to its vitality been raised, I should have attributed the fistulous opening there to an abscess from that tooth, but I reasoned that necrosis of a portion of the alveolar process had taken place, and the discharge therefrom was finding exit alongside the twelfth-year molar.

You will remember that at this time every symptom of inflammatory action had subsided, with the exception of a slight scar upon the lower part of the face, which had resulted from the first incision. Once in ten days it would open and then heal up again. I attributed this to the existence of a certain amount of necrosed bone. It seemed to me almost impossible to have had such an active inflammation in this connection without some necrosis of the bone taking place. I tested the twelfth-year molar, and it seemed to respond to all the tests of a vital tooth, but the patient was very nervous, and it was difficult to decide. However, the problem solved itself in a most unexpected way. The articulation of the upper twelfth-year molar to the lower was very close, the palatal cusp of the upper fitting into a depression in the grinding surface of the lower like a wedge, and during a meal he suddenly bit down on something hard and split this apparently

healthy lower twelfth-year molar through its entire antero-posterior diameter, which resulted in my discovering that it was absolutely pulpless. It was therefore at once removed, and within a week afterwards the fistulous opening on the face healed, and all traces of discharge ceased. I have examined the case carefully since then, and am unable to detect any fistula in the mouth, and he is to all appearances quite well. Dr. Peirce saw the case with me in consultation, and approved the treatment which had been carried out; he believed in the existence of some necrosed bone. I have not been able to discover it so far, although Dr. Peirce believes he has detected a point where there is some slight necrosis in the alveolar border.

The case ran over a period of nearly four months before recovery was complete. I want especially to emphasize the infectious character of the inflammation in the case as I have presented it to you. It seems perfectly evident to me that the septic material, which was the primary irritant in this case, was, if produced by micro-organisms from an infective pathogenic germ, different from that which produces ordinary abscess, the staphylococcus pyogenes. I fully believe that, if the case had not been treated upon general surgical principles by free evacuation of the discharge, and by washing out the pus-cavities with antiseptic solutions, and the patient treated constitutionally with stimulants and tonics, he would have died.

I wish to again call attention to the character of the pus-discharge. It was at no time of a creamy yellow color, but clear, viscid, and albuminous in character. It seems to me that this clinical point may be related to the kind of micro-organisms producing it.

If you will examine the literature of the subject, you will find that the effect produced by the action of various micro-organisms upon a given pabulum widely differs and varies in its expression, along with the other vital phenomena, according to the kind of organism or the class to which it belongs. From this view it is of interest to note that in the history of the case two distinct kinds of inflammatory action, presenting very different clinical phenomena, occurred in the same patient; both of these might be regarded as alveolar abscesses; yet one was benign in character, the other attended with alarming and unusual symptoms. The infectious character of the last attack was plainly evident, and if due to the invasion of a specific pathogenic germ, as the researches of Miller warrant us in believing, the unusual character of the discharge, perhaps, may bear a significant relation to the diagnosis in such cases, as

its nature would seem to depend upon the character of the invading micro-organism, rather than upon the systemic condition of the patient. This view, I think, is sustained by the occurrence of two distinct forms of suppurative inflammation in the same patient, and involving the same territory,—the discharged pus being in each instance widely different in character; that is, the pabulum being the same, and the invading organism different, resulted, among other things, in a dissimilarity in their waste products.

The case which I have imperfectly presented is, I think, important. It is of a kind which, fortunately, occurs rarely, and I have felt justified in bringing it before you, with a view to calling out some expression of opinion upon this class of cases.

DISCUSSION.

Dr. Darby.—The case related by Dr. Kirk is exceedingly interesting, and reminds me of one which came under my observation some years ago, and which, I regret to say, terminated fatally. It was that of a gentleman who was much run down in health and in an anæmic condition. He applied to have a broken-down central incisor cut off and an artificial crown grafted upon the root. I found, upon examination, that the pulp was living, and made the usual arsenical application to devitalize it. He called a day or two later, when the pulp was easily and entirely removed, and the root prepared for the crown. An antiseptic dressing was made to the root, and the following day the crown was set. Twenty-four hours later he complained of some soreness in the tooth, which I supposed would readily yield to the ordinary treatment. I saw no more of the gentleman until the following evening, when I was summoned by the family physician to his bedside. I found the patient unconscious, and a malignant alveolar abscess over the root of the tooth in question. I at once lanced and liberated the pus, which was abnormal in color and mingled with dark-colored blood. The patient was unquestionably suffering from pyohæmia. I learned the following day that he was no better, and the day following he died. His physician assured me that the abscess had been the cause of his death, and said that he would probably have died from the prick of a pin had the wound suppurated.

Ten or more years ago a lady called to have the roots of an inferior first molar removed. There was at the time an acute abscess at the apex of one of these roots. After removing one, she

concluded that she would defer the extraction of the other. Ten days or two weeks later, I was asked to see her at her house. I found that she had continued to suffer pain, and that the abscess had not been arrested, but the pus had burrowed through the tissues of the neck and had seemed to be drawn by the poultices which she had used constantly lower and lower, until an opening had been made at a point opposite the arm-pit and nipple. It was with the greatest difficulty that she could open her mouth a quarter of an inch. I succeeded in prying her jaws apart, and removed the other root of the offending molar. After a few days' treatment the discharge ceased and the patient recovered. She was a strong, healthy woman at the beginning, but was much reduced in flesh and strength after this prolonged experience. Had she been anæmic, like the first case mentioned, the termination might have been the same.

These are some of the terminations which are liable to occur from apparently simple cases of alveolar abscess.

Dr. Truman.—This subject is not one that can well be discussed, as it is simply a relation of facts. It is not a slight matter to have a tooth with alveolar abscess. I remember a case that came into my hands a number of years ago. The patient was taken with acute pericemental inflammation. Having been called out of town for some weeks, his physician attended him. The inflammation became very severe and extensive. What its character was I never learned, but death occurred before I returned. These cases are very unpleasant, as the dentist usually receives all the blame.

I could not quite understand Dr. Kirk's reason for performing an operation externally in the case described. I could not comprehend the necessity for it. If the mouth could be opened, why treat the case externally with poultices? Why not enter the pus-pocket by the mouth? It seems to me that that would have been the proper way. If I had had the treatment of that case, I should have applied cold applications externally, and ice to the jaw, and hot applications in the mouth, and performed the surgical operation there if it should have been required.

Many of these cases come to us after extraction. The relations of the periosteum and pericementum are so intimate that if one be affected the other is necessarily more or less disturbed, and the inflammation that leads to the formation of pus must, in many cases, be continuous. If the socket is closed with coagulated blood and not injected with antiseptics, I cannot understand how this trouble is to be prevented. It seems to me that to avoid these pathologi-

cal conditions, the greatest care is required in the use of antiseptics after the extraction of teeth.

I criticise Dr. Kirk in the use of the words "laudable pus." There is no such thing as laudable pus; pus is never laudable. I also object to the idea that pus has a definite period for development. Diapedesis of the leucocytes begins very shortly after inflammation is aroused, and will continue to be a factor in the production of pus until normal conditions are established. The part taken in this process by micro-organisms is not now under consideration.

Dr. J. D. Thomas.—There are one or two points in Dr. Kirk's statement of the case and in the discussion which impress me quite forcibly. You probably noticed in Dr. Kirk's case that the patient was evidently in a run-down, nervous condition; that his systemic tone was considerably reduced below normal. He did not present an anæmic appearance, yet constitutional conditions were such that violent inflammation or septic infection was bound to follow any exciting cause.

In his case it happened to be a tooth, but I believe the result would have been the same had he received the scratch of a pin upon any part of the body, or a bruise or injury of any other form.

In Dr. Darby's case the patient was in poor health and extremely anæmic. With such conditions there seems to be no limit to which septic infection may follow, either in the retention or removal of a diseased tooth. A member of my own family, while in a poor state of health, was attacked with pulpitis in the right superior second bicuspid, which was treated without success. As a result she lost every tooth back of the canine on that side, accompanied by a perforated antrum.

Fortunately, these extreme cases are very rare, particularly such as the case reported by Dr. Kirk and the one referred to by Dr. Darby; but it is no uncommon thing for inflammation to extend to the surrounding bone and soft tissues, even after the removal of the diseased tooth, resulting in the loss of one or two, or perhaps three, adjoining sound teeth, together with considerable process and bone.

In treating, I have had the best results by encouraging the formation of pus in the inflamed part with hot fomentations until relief from pain is obtained, after which, clearing the sockets of putrescent matter by using antiseptics and astringent lotions, insisting upon systemic treatment in the mean time by their family physician.

Dr. Jefferies.—I do not know that I have anything to offer. I have never had a case similar to Dr. Kirk's; but a good many years ago I remember one that, I think, was spoken of before at a meeting of this Society. Perhaps the circumstances attending it will bear repetition at this time; although it was not, strictly speaking, a case of abscess, it resulted in the death of the patient. It came from the treatment of an exposed nerve, and filling a root with gold, preparatory to putting in a crown-filling. The patient lived in Wilmington. The dentist extracted the pulp and filled the root, leaving the crown for a future operation, and sent the patient home; and within twenty-four hours intense pain followed in and about the tooth. It grew so bad towards the evening of the next day that he came to me and implored me to remove it, which, under the circumstances, I did, as there was no possible chance of getting the root-filling out to treat it. It was the next or the second day after that his family physician sent for me to go to his house and lance the gum, thinking there was inflammation, of which I saw no sign. Nevertheless, under his orders the gum was freely lanced. I heard no more of the case until I heard of the man's death. The physician was not of an investigating turn of mind, and I do not know exactly the immediate cause of death. It was evidently in some way connected with the treatment of that tooth. The physician's certificate, I believe, was that death occurred from congestion of the brain.

Dr. Faught.—From my early practice I made it a rule not to let my desire to save teeth make me do what might result in a possible fatal termination, where the patient gave evident signs of run-down health, and in the treatment of cases in the lower jaw particularly.

I agree with Dr. Thomas in what he said as to the use of antiseptics. The treatment seems to be simply a treatment with hot water. After extraction in these cases I always advise the use of hot water within the mouth, to bring about the constant stimulation and freest evacuation in the socket. I also long ago adopted the practice of never allowing a tooth to be extracted without having the patient report to me within the next few days, until I am sure all possible tendency to a dangerous result disappears.

I condemn the insertion of any pledgets of cotton in the sockets immediately after the extraction of teeth. The socket should be left freely open, and not have in it anything which will accumulate blood and interfere with the freest flow of pus. I have in many instances been obliged to remove pledgets of cotton put in by others,

and to the relief of the patient. I believe the recurrent trouble in almost every instance was due to cotton being packed in the cavity and interfering with the free evacuation of pus.

Dr. Rehfuss.—While the discussion has brought out many cases and methods of treatment of various practitioners, still I do not believe that it has shaped itself towards the point that Dr. Kirk most desires, and for which he has brought the subject before us; and that is, what is the duty of the dentist in these cases of alveolar abscess, where we have symptoms of possibly fatal results? All practitioners have cases where there is considerable difficulty in curing them; where possibly an abscess has assumed a chronic form. What the methods of treating are I am not taking into consideration. I cannot at present recall any of my own cases of this kind, but I can remember one of a physician. There was a patient of his who had trouble with a tooth, and in which an alveolar abscess caused septicæmia, and finally death. Now, the physician in this case should have called in the dentist. Dr. Kirk's subject has brought up this question: the duty of the dentist, and the duty of the physician in exceptional cases of this kind. The dentist, in treating a case of alveolar abscess, should follow out his methods in general, and when these constitutional symptoms become pronounced; when he can see or judge that septicæmia or some other condition unknown to him has set in, it is then unquestionably his duty to call some one in consultation who is familiar with diseases of this character. I think that is one point that Dr. Kirk has wished to bring out.

Dr. Head.—There has been a great deal said favoring the use of antiseptics after extraction. Whatever may be their value in such cases, I do not think it has been proven. The saliva is a great carrier of germs. No matter how often washes are applied to the socket of the tooth, the diluting saliva will follow, defeating all attempts at antisepsis. In fact, the experiments of Dr. Miller leave the question of their utility in decided doubt.

Dr. Truman.—I would like to ask Dr. Head what he would do in gingivitis. The ordinary saliva is constantly running in the mouth, and if he do not use an antiseptic there, I cannot see how he will treat it. There are various preparations that will destroy micro-organisms, and there are others which inhibit their growth. Take, for instance, hydro-naphthol or creolin. If proper solutions of either of these be used continuously, micro-organisms cannot develop in injurious numbers. Clinical experience has demonstrated this over and over again.

In answer to Dr. Thomas, I wish to say, I do not approve of cotton in the socket. I believe in cleaning it out and then treating it antiseptically. I am fully satisfied that all inflammations of the mouth should be treated in this way. I treated a case of necrosis involving the entire right superior maxilla for five months, and it originated from the extraction of a wisdom-tooth.

I can endorse Dr.Thomas's assertion that danger exists of alveolar abscess extending to another tooth. I had an illustration of this that occurred in the clinic of the University this winter. It was that of a young girl, very anæmic, in which the teeth were separated by rubber. The result was inflammation and alveolar abscess in the lateral tooth; it extended to the canine, and, when I saw it, necrosis had taken place. To what extent this went I am not informed, as the patient passed into other hands.

Dr. Faught.—There is one sentiment in my mind that I would like to express. It is one in which I have secured statistics with a view to preparing a paper.

A person applies to a dentist with a cavity to be filled; the patient thinks of nothing but a plug to go into the cavity, and all surrounding conditions are entirely lost sight of. It simply reduces itself to a mechanical operation. We get the same idea too frequently, I think, in regard to alveolar abscess. I am speaking of the acute form.

The sentiment is simply this: That to my mind alveolar abscess belongs to that class of surgical operations best treated at the home of the patient, and that the dentist should become a visitant until acute symptoms have abated, and that systemic conditions should never be omitted in its treatment when purely local treatment is not meeting the requirements of the case. We too often look only to local treatment. I think we ought to relegate this acute form to the room and bed, where the case can be managed by visitation.

Dr. Thomas.—Dr. Kirk calls attention to the efficacy of phénol sodique. I agree with him in its applicability to cases after extraction. It is one of the best antiseptic remedies we have; but in cases of acute periostitis, where the pain continues for some hours after extraction, its use is contra-indicated, and hot fomentations are the more desirable. After the inflammation has reached its height and is at a stand-still, then by washing the cavity and applying a loose pledget of cotton saturated with phénol, you have, to my mind, the best means of rapid recovery extant.

Dr. Jack.—I have not had a case similar to the one Dr. Kirk

has referred to. I would only express caution when serious peridental inflammation occurs in the lower maxilla, and would call especial attention to the danger in cases of purulent inflammation connected with the inferior wisdom-tooth.

It may be known to some of you that a few years since there happened a case, in the upper part of Philadelphia, of the death of a patient under the care of a physician, where the cause of death was assumed to be tonsillitis, but it was found, as the result of the autopsy, that the death was due to the occurrence of abscess of the inferior wisdom-tooth, the result of which was the infiltration of tissues at the base of the tongue. The pus had burrowed along the course of the muscles, and had very freely infiltrated the tissues and the hyoid bone with pus. The patient died of pyæmia.

In my experience a case occurred of a prominent clergyman who came to me with inflammation of a lower wisdom-tooth, and it had a very unpleasant appearance and was already threatening, as I thought, to burrow along the mylo-hyoid. I said to him, "This tooth should be removed;" but he was a man of determined disposition, and said he would not have it out. In the course of a few days his physician sent for me and wished me to visit the patient. When I arrived at the patient's house I found extreme evidence that there was infiltration of pus. I said that the tooth should be removed at once. The response was that the condition of the patient was such that it would be dangerous to health and life to attempt it under the circumstances. My response was that if the tooth was not quickly extracted, the most disastrous consequences might ensue. The tooth was removed, and I may state to you that the patient was confined to his bed for some six weeks. The physician treated him for a conditon similar to pyæmia.

I only cite this case, not that it bears any direct resemblance to those given, but to state my view that in cases of severe inflammation of the peridental membrane of the lower wisdom-tooth, it should be extracted at the earliest possible moment after the abscess condition becomes indicated.

Dr. McQuillan.—I would like to ask this question: How long are we warranted in treating a devitalized tooth, particularly those that have blind abscesses? We have all had experience in filling teeth, and dismissing patients and telling them they can go for six months, and having them come back the next day; and the question has come to me, How long are we warranted in treating these teeth when it is impossible to get a fistulous opening, and

after the tooth is filled is it necessary to remove the filling to continue the treatment? It seems to me, particularly in the case of the lower molars, that at times I am running great risk in continuing very long treatment.

Dr. Kirk.—I would like, if I may be allowed, to give a word of explanation at this point that I hope will serve to direct the trend of the discussion on this subject. I omitted a full description of what was done when the patient returned after the extraction of the tooth. The omission was accidental. I washed out the socket with water; I did sterilize it as fully as I knew how, but not with corrosive sublimate; I used carbolic acid in full strength. I did endeavor to evacuate the pus through the bottom socket by passing a sharp-pointed instrument down as far as I dared. I stated in the description, I think, that the jaw was unusually deep. There was a distance of an inch or an inch and a quarter between the upper border of the alveolar ridge and the free lower border of the body of the maxilla. This accumulation of material, whether pus or not, was situated on a line immediately below the socket of the sixth-year molar and upon the border of the bone. If I had waited to carry out the treatment such as Dr. Truman suggests, and which I would use in a majority of cases, I believe the patient would have died before an evacuation of the accumulated pus could be brought about within the mouth.

In speaking of laudable pus, I should have qualified it by saying, so-called laudable pus. I agree with Dr. Truman, that there is in a certain sense no such thing as laudable pus. I used the term in its popular sense, in order to make clear my description of the kind of pus referred to.

I would be glad if Dr. Truman had explained a little more fully just what constitutes pus. It is yet an open question. I have not a full and definite idea of what constitutes pus; but the diapedesis of leucocytes has been shown to be but one factor in its formation. Some source of irritation is needed to account for the diapedesis, and I think almost all pathologists agree that it is generally the result of some infection.

The reason I did not operate from the inside was because it was clear to my mind, from a careful examination, that I could not establish a free evacuation of pus by that channel, and it was also evident that the condition with which I had to deal was one of those pathogenic infective inflammations which was likely to produce pyæmia. I was actuated by my desire to prevent the man from dying, and by the belief that, in order to avoid a possible fatal

result, the inflammatory products should be evacuated as soon as possible.

The incisions made on the outside of the face in this case have healed up almost without a scar. They were made with a very sharp knife, and such an incision always makes but a slight scar. I believe I materially shortened the course of the disease, if I did not absolutely save the patient's life, by the operation as described.

I brought a report of this case before the Society for two reasons. I think we are inclined to group under the general term, alveolar abscess, a number of diseases which are related only by reason of their position, and which have the factor in common with many other acute inflammations, the resulting discharge of pus. But, I judge, from the investigations of Dr. Miller and others who have written upon the subject, that it is time that we recognized that there is a difference in these diseases. Alveolar abscess is a general term. I take it for granted that we have all of us read enough on this subject to warrant us in concluding that the character of inflammatory action is determined largely by the nature of the germs which produce it. One of the diseases which I have outlined to you this evening is what is known, when it occurs apart from the jaws, as phlegmonous inflammation. It is an inflammation which is closely related to erysipelas, and is a quite different disorder from ordinary alveolar abscess, and is frequently fatal, as shown by the number of cases that are reported by Dr. Miller in the reprint from the *Dental Cosmos* which I have distributed. I have had these reprints made for this purpose simply because I was interested in getting an expression from the members of this Society on this very important subject.

I firmly believe that if I had not carried out the treatment in this case upon general surgical principles, I would have lost my patient. It was not alone because the patient was run down that this particular form of abscess occurred, but largely because of the specific nature of the infection.

As to cotton, I would like to say one word in favor of it. Of course, plain cotton may and does, inside of a few hours, become an infectious mass. My use of it was simply as a vehicle for retaining antiseptics in contact with the wound. If the socket is left open, the next time you wash it out you will have a collection of food *débris* in a state of decomposition, which, to my mind, is much more offensive than that of cotton-pledgets properly saturated with some antiseptic. With regard to suitable antiseptics, we have phénol sodique. Without attempting to give a scientific explana-

tion, I know, from practical experience, that nothing I have used has acted so kindly as an application to the sockets, after the extraction of teeth, as this agent. I do not approve of leaving cotton-dressings in the sockets for an indefinite time; therefore, the patient is given directions to remove it. If not able to do so, he is directed to come back to me, to have the socket redressed in a similar manner, until healing is well established. Under such treatment I get better results than where a simple mouth-wash is used. By the means of cotton-pledgets I bring the antiseptic into close contact with the tissues I wish to sterilize.

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THE regular monthly meeting was held May 12, 1892. On the completion of the routine business the president introduced the essayist of the evening, Dr. Joseph Head, who read a paper entitled "Dental Litigation, Past and Present."

DENTAL LITIGATION, PAST AND PRESENT.

BY JOSEPH HEAD, M.D., D.D.S.

THIS paper is a plea for absolute confidence in the Dental Protective Association. It will endeavor to show why every dentist should not only be a member, but an active partisan, working in every way to lighten the burden of those few men who by arduous devotion are saving each dentist an annual tax of at least a hundred dollars.

The Sheffield Tooth-Crown Company is operated by the same men who have in times past made the Dental Vulcanite Company so formidable.

Many dentists have thought to escape molestation by refraining from the manufacture of Richmond crown- and bridge-work, but they have not appreciated the danger which threatened, and which undoubtedly would have overwhelmed them, had not a few unselfish men, led by Dr. Crouse, championed the rights of all dentists at the risk of imprisonment and heavy fines.

The Tooth-Crown Company have patents not only on the Richmond crown- and bridge-work, but in addition, their patents, numbering almost a hundred, include innumerable well-known daily operations.

If these claims be sustained in court, no man can legally invest a tooth for soldering, or cement in any crown whatsoever, whether it be held by band, pin, or screw. Neither can he take impressions or articulations. Numerous other cases could be quoted, but these are sufficient to show the injustice and weakness of their claims.

But because they are unjust or illegal they are none the less to be feared. They can only be rendered harmless by vigorous opposition and close organization.

A certain Mr. Josiah Bacon, treasurer of the Goodyear Dental Vulcanite Company, is quoted to have said, "I don't care whether a patent is good or not, give me money enough and I will put it through." And he proved his assertion.

In 1852, Dr. Cummings tried to get a patent on the process of making rubber dentures. He was not the inventor, but picked up

the idea from dentists with whom he associated. In fact, so little did he know of the process, that he included gutta-percha among the vulcanizable substances. And at one time he actually hired a mechanical dentist to teach one of his students to make rubber plates, he himself not being competent.

From 1852 to 1854 he tried to get the patent, but, not having sufficient influence, failed. Then he abandoned all attempts until 1858, when he tried again, and was again refused. Still he persisted, until, with the aid of Josiah Bacon, treasurer of the Goodyear Dental Vulcanite Company, in 1864, he succeeded in getting a patent, embodying not only his original claim, but all improvements made by the profession up to that time.

The patent was issued in absolute violation of law and justice.

Morally, he should not have had it, as he was not the real inventor. Technically, he should not have had it, because the laws forbid a patent to be issued for a method where a well-known substance is applied to a well-known process. This law directly applied to the case in point, as teeth had previously been flasked for the purpose of making plates of metal, which was poured into the mould. Again, the laws say, "No patent can be granted for a process that has been in general use two years previous to the petition." There are many other laws which applied, but these two alone were sufficient to render the patent unsound.

Mr. Bacon, who had bought this patent, did not care whether it was sound or not. He was about to prove his boast that a good or bad patent could be made successful with plenty of money. He wanted this, because it would extend the Goodyear patent nine years, so far as it related to artificial dentures.

When Cummings's patent was issued, there was a terrific storm of indignation throughout the country. Protests from individual dentists were presented on all sides, but there was no organization for vigorous opposition, as the Goodyear patent, covering the same ground, had yet several years to run. So the storm subsided, and the wily Vulcanite Company succeeded.

The story runs as follows: A certain Dr. Newbrough invented a process for hardening rubber by iodine, and issued licenses to several dentists offering to protect them from any suit that might be brought against them by Bacon & Co. Among these licensees was E. B. Gardner, against whom the Vulcanite Company brought suit for using iodized rubber, claiming that it was an infringement on the Cummings patent.

According to his agreement, Dr. Newbrough undertook Gard-

ner's defence. Then Bacon proved his boast: he compromised with Newbrough, contracting to give him a share in the profits of the Vulcanite Company in exchange for all his patents. Next he engaged Newbrough's attorney to continue the Gardner case and finally permit the Vulcanite Company to win. Thus would the validity of the Cummings patent be established.

In proof of these statements it may be of interest to quote Dr. Newbrough's sworn testimony before the United States Supreme Court, bearing the date 1871, which may be found printed in full on page 190 of the *Dental Cosmos*, vol. xv. After a description of his patent he says, "Among my licensees was Dr. Benzoni E. Gardner, of Providence, R. I. In September, 1868, Dr. Gardner sent me a writ which had been served upon him at the suit of the Goodyear Dental Vulcanite Company and Josiah Bacon.

"Having been advised that my patents and their use involved no infringement of the Cummings patent, I was not unprepared for litigation, and promptly assumed the defence of my licensee, Dr. Gardner. The answer was filed after a preliminary injunction had been granted after argument. This ended the proceedings in the Gardner case, except as hereinafter explained. Previous to the Gardner suit in Rhode Island the same complainants had sued me in this district, and I was proceeding duly with my defence.

"No testimony was ever taken in the Gardner case except the affidavits used on motion for the injunction, but the testimony that afterwards went to make up the Gardner record was stipulated into it out of other suits. On the first day of July, A.D. 1869, a written compromise was executed between the Goodyear Dental Vulcanite Company, Josiah Bacon, and John H. Cheever, Henry E. Ficket, and myself, dismissing all the suits against myself, and I introduced into that compromise the dismissal of the suit against Gardner also, because, as I was the real defendant of his case, I regarded that as involving myself, and so settled it in the above-mentioned compromise by giving him a free license during the term of all the Goodyear Dental Vulcanite Company's patents. With the execution of this in writing all the then pending questions between the company, my licensees, and myself were finally settled and terminated, and from that time forward I have not in any manner controlled, directed, or participated in any defence or proceedings in the Gardner or the other suits above mentioned; but, on the contrary, my only interest in any of the matters has been that which I had in common with the company under the aforesaid compromise. After this compromise was effected, and as a mat-

ter of personal friendship to John A. Foster, and also to prevent the dentists from employing him against our then common interest, I did then get the company to take Mr. Foster as one of their lawyers, and he told me from time to time that the Goodyear Dental Vulcanite Company has paid him since July 1, 1869, for all services performed by him in the Gardner case; that after the argument of that case in Washington, before Judge Clifford, Mr. Foster told me that the company had paid him two thousand two hundred dollars for compiling the case. I remember this distinctly, because Mr. Foster told me at the same time that he would never have got his money from the company if he had not threatened 'to blow on the whole thing;' meaning, as I understood, to let the dentists know that it was a put-up job.

"I remember that shortly after my compromise the lawyers who were conducting the case concluded to put in all the testimony for both sides, so that, should the collusive suit be discovered, the testimony would be so fairly put in that their complicity in the matter would not involve themselves; and further, that after the case was ready for argument the dentists were to be informed of the fact, and induced to accept the case, as then prepared, so that they might take part or not as they chose.

(Signed) "J. B. NEWBROUGH."

This contract was carried out September 8, 1870. No defence was made. The evidence was all in favor of the Goodyear Rubber Company, and from that time a new reign of terror was inaugurated. The Cummings patent had been legalized. Still they were not satisfied; but, to make their position more secure, Newbrough appealed the Gardner case to the Supreme Court. Bacon won this suit also. And thus the illegal Cummings patent would have been secure and impregnable if the contracting parties had not quarrelled.

Then the dentists combined and asked for a new trial. In view of the collusion exposed, the courts granted their request. That, however, the Vulcanite Company eventually won is a matter of history.

The dentists, with their loose and imperfect organization, were an easy prey. Henceforth each dentist who made rubber plates had to pay a tax varying from seventy-five to one hundred and twenty-five dollars a year, and was compelled to keep his books always open to the scrutiny of the Vulcanite agents. Failing to do this, he was liable to fine and imprisonment.

This story should teach an impressive lesson. Since unscrupulous corporations by mere force of money and influence can prey upon the individual dentist, can ruin the practitioner by expensive lawsuits, no matter how just his cause may be, since these facts are indisputable, there can be but one remedy. The dentists must also form a corporation for the purposes of self-defence. And this is what has been done. If for the use of one patent the old Vulcanite Company charged seventy-five to one hundred and twenty-five dollars per annum, what must necessarily be the result if the Tooth-Crown Company succeed in levying taxes on their eighty or ninety patents?

This company, up to this time, has been restrained by Dr. Crouse and his associates, who have had not only the courage to defy these powerful foes, but also the keenness to expose their methods. The Dental Protective Association lawyers are not to be bribed or corrupted, and thus suit after suit of the Tooth-Crown Company has been withdrawn in the face of overwhelming contrary evidence. They stand fully under the control of the Dental Protective Association.

Bacon would no doubt now be a moving factor in the new company if he had not been shot by a dentist whom he had hounded to the verge of desperation.

What, then, does this state of affairs mean? It means that the leaders of the Dental Protective Association have proved themselves worthy of implicit confidence. It means that any dentist now refusing to join is like the man who built his house upon the sands. For in a short time, when a full list of members of the association shall be published, those without the association will be left at the mercy of the Tooth-Crown agents, and will only be allowed to enter the protecting fold by paying an entrance fee of many times the present assessment.

The dentists are not asked to subscribe money towards fighting a doubtful battle: the victory has already been won. They are simply asked to pay ten dollars towards a campaign which in times past has saved them hundreds of dollars, and which in times to come will be a strong guarantee against oppression.

If, however, through selfishness or shortsightedness, many stay outside, they must not complain if they meet the fate of stragglers on the field of battle, who are captured or slain by the flying foe.

The Dental Protective Association is an assured success. And every dentist should gladly give ten dollars to an organization so capable and trustworthy.

DISCUSSION.

Dr. Boice.—I would like to refer to one article Dr. Head mentioned. The Cummings patent was not for making rubber hard or rubber in plates or any shape or form, but simply for attaching porcelain teeth by means of metal pins into the rubber. The old Goodyear patent was for making plates of hard rubber, but the remarks on the injustice of the patent are undoubtedly true.

The Protective Association is the first association, I think, that has ever been organized for one object,—the protection of dentists. When it was first organized I joined it. It is necessary that we should be banded together in one association, as we have had nothing heretofore in dentistry, and I think it the duty of every member to talk to his neighbor and ask him to join. I asked Dr. Crouse some time ago how Pennsylvania was doing in the Protective Association. His language in reply was more expressive than elegant. Although we were one of the last States to see the importance of this work, can we not in the near future be one of the first in this good cause?

Dr. Rehfuss.—I am not aware that there are any law-points involved in the paper. It is an excellent history of dental patent litigations, which should have been its title, as there are so many different kinds of litigation in dentistry.

The Dental Protective Association has done wonderful work in protecting us. None but one who has gone through the whole patent matter, and who has thoroughly investigated nearly every case that has occurred in dental litigation, can realize the immense number pertaining to the dental profession that have come forward, particularly of late years. The history of the Goodyear patents is well known to you all, and have been very vividly and explicitly brought out by Dr. Head.

The previous speaker was in error when he said the Goodyear patent was not for vulcanizing rubber. It was for the process or composition, vulcanizing for *all purposes*. The Cummings patent was for the adaptation of vulcanized rubber to dental purposes. The reason for taking out the latter patent was, because the former, for the application of vulcanized rubber, would expire three or four years previous to that of the latter. Now we are threatened with a different class of dental patent litigations, and it seems to hinge entirely upon the bridge and crown patents. In the case of the International Tooth-Crown Company *vs.* Richmond, an entirely too broad construction was given by the judge, and it was erroneous,

giving the patentee more than was claimed in the patent right. The patent gave him the right to cement bridges or continuous bands around the adjoining teeth, and thereby holding them in place permanently. The judge in this case gave it as his opinion that a crown was nothing more than a continuous band with a roof upon it, and allowed him a broad construction of his patent-claims, thereby making it illegal for any dentist to put in a bridge-piece which is fastened upon adjoining teeth by continuous bands or metal crowns.

The whole history of patent litigation has been a mistake throughout. A mistake in legal interpretations. The Dental Protective Association is doing a good work in proceeding against this, and in contesting these patents. As the majority of dental operation patents are worthless, I feel protected in doing any operation in dentistry, since I am a member of that Association. No man can afford the pecuniary means or time necessary to collect evidence in these cases or fight them single-handed. We must remember in our profession the old adage,—in union there is strength. Therefore I would call upon every member present who is not a member of the Association to join. There is but about one-fourth of the profession in that Association, and when we have the full number we can look forward to fighting not only unjust demands of patent agents, but other classes of abuses in dentistry of a legal nature.

(At this point Dr. Faught asked if it would not be well for those present not members of the Association to give their reasons for not being such. The answer in general was carelessness rather than a want of interest.)

Dr. Bassett.—This subject seems to admit of only a one-sided discussion, but I would like to narrate a little incident. I had the pleasure of joining this Association when I first heard of it, but the thing that influenced me was the experience of a classmate of mine. He had been practising in New York with some of these tooth-crown people, but finally separated from them and pursued some of the methods that they already had in their operations, but the Tooth-Crown Company soon followed him, and he undertook to fight them by employing a lawyer. He spent several hundred dollars, all the money he could spare, and finally had to give up the case because his money gave out, and he then took out a license from the company and went on. He was one and they were many, so they won the battle. As soon as this Protective Association was formed it seemed to me a very good way of combining and protecting ourselves at a very slight expense.

Dr. Truman.—I suppose many in the profession are like some present,—they have deferred attending to it. Those who have been sufferers from the old Goodyear Rubber Company do not require any urging to go into the Dental Protective Association. The trouble, the annoyance, the spy system that we all experienced at that time is well remembered, and we would be precisely in that same condition to-day were it not for Dr. Crouse and his Association.

I regard this Dental Protective Association as something more than a mere protection in a legal sense. There is nothing so powerful as a selfish interest to bind men together. As I said recently in an editorial on this very subject, that it is an important move for the man who is isolated and is yet able to feel through it that he is in touch with every other man in the profession. I feel more and more every day the necessity for men to get away from their petty, narrow jealousies. Dentists are full of it. We are broader in this country I think, taken as a whole, than anywhere else in the world. Yet there is room for improvement.

I remember when I first commenced to practise in my father's office, if a dentist came in he was considered an intruder, with the supposed intention of acquiring information without paying for it, and consequently the bars were put up in every office. This association will not only protect us legally, but will bring us together as we have never been before.

I hope those who are not members of the Protective Association will join. I know at times pecuniary difficulties are in the way, but Dr. Crouse makes it as easy as possible by the note plan. As has been said, he has expended time and money. I don't know another man so self-sacrificing. It requires just such a one to take the lead and stir the profession to its duty.

Dr. Head.—I think probably it might be well to explain to any dentist who might send their notes to Dr. Crouse that he will give them protection from any suits which may be entered against them from the time he receives such notes, but that he cannot let them legally join until the notes are paid. I know there has been a great deal of misunderstanding on that subject, many supposing that the notes meant that they were enrolled in the society, but Dr. Crouse is unable to do this for the reason that the money must be paid into the treasury absolutely before such enrolment can take place. To do that he would have to advance money himself, and, of course, where so many notes have been sent to him he cannot afford to do it.

Dr. Boice thought it appropriate that the Society should join as

an individual to encourage the Association. A number of organizations have adopted this course.

Motion to that effect was made and carried.

Dr. Truman, under "Incidents of Practice," introduced a patient of Dr. Peeso with a full set of crown- and bridge-work which he thought worthy of examination.

Adjourned.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

THE regular meeting was held October 8, 1892, at the rooms of the Society, 1228 Walnut Street, Philadelphia, President Louis Jack, presiding. After the transaction of the usual routine business, a paper by Dr. W. G. A. Bonwill, of Philadelphia, was read on the following subject: "Mechanics in Dentistry.—Is Dentistry a Science or a Profession?"

MECHANICS IN DENTISTRY.—IS DENTISTRY A SCIENCE OR A PROFESSION?

BY W. G. A. BONWILL, D.D.S., PHILADELPHIA.

A VERY unpalatable subject is this I have chosen,—"Mechanics in Dentistry." There is no other word in dental language that is held, to-day, in such disrepute. Every year there is fresh venom hurled against it, or any reference thereto, and it would seem to have fallen from the high eminence which it had in the early days. The good old name has a very strange synonyme,—prosthesis,—which might be well if it were confined to the supply alone of artificial dentures. A moment's reflection, however, will show that when we attempt to divide dentistry into operative and prosthetic or mechanical, we do injustice to our profession, and we assume a false position for our great art, which is founded almost exclusively in our ability as mechanicians, and without which, to a great degree, we would be helpless.

It has become such a disgrace to be known as a mechanic that it is amusing to see, not only dentists, but nearly every man upon the street, or wherever you may go, taking to the English mode of carrying the arms bent at a decided angle at the elbows, and the thumb projecting from the wide-open hand at as great a tangent as possible. You may be curious to know what this means. Well, I am responsible for the version and why originated.

The very act of using the hands to grasp the handle of a hammer, or lift a weight, necessitates the closing of all the fingers and the thumb over them, while the arm is usually, when lifting, nearly in a straight line. These finally give to the individual, when walking, arms that assume a line parallel and vertical with their body, with the hands mostly closed. See the application. A gentleman found with his arms bent at the elbows and thrown as far as possible—gracefully—from contact with the body, his hands

with all fingers outstretched and thumb at a right angle with the index finger, will be known as one who never grasped an instrument or extended his arms straight to lift any object. The poor mechanic will be found invariably to take on exactly the opposite. He has never heard of "Hogarth's line of beauty." You may smile at this, but there is too much truth in it. I do not object to graceful positions, but teach the mechanic what it means and let him be an artist.

Students generally feel this tendency of our profession, and it is almost impossible to get them to prosecute this branch of dentistry. Unless they are compelled to learn laboratory work first and thoroughly, they never become efficient in the mechanical department. Once permit them to go to a dental college, where they are allowed the first session to handle delicate instruments over the operating-chair instead of rough tools, the hammer and the "anvil chorus" is no longer heard.

Before we touch upon science, let us ask whether we are a profession? What is its meaning?

The three learned callings are theology, law, and medicine.

The occupation, if not mechanical or agricultural, is placed as a profession. If you can make this of dentistry I am unable to interpret the meaning of our lexicons. The teaching of mathematics does not make it a profession any more than teaching mechanics. We cannot, then, arbitrarily place ourselves before the world as a profession, as now understood; but we are artists, artisans; or we can, more properly, be called scientific artisans.

What is science?

Science is a systematic and orderly arrangement of knowledge.

Facts and truths are the ultimate principles.

Pure science is a knowledge of forms, causes, or laws.

"While both science and art are synonymous, as they investigate truth, science is restricted to the inquiry for knowledge and art for the sake of production."

"The most perfect state of science will be the high and accurate inquiry, and the perfection of art the most apt and efficient system of rules,—art always throwing itself into the form of rules."

What are the sciences which have been so long recognized as seven in number?

Grammar, logic, rhetoric, arithmetic, geometry, astronomy, and music.

You perceive that medicine, law, and theology are not mentioned. They are professions.

You do not find mechanics among the seven. Yet mechanics is made up of geometry and arithmetic, placed together and made efficient and demonstrable by that higher power—God-like in itself—that conceives, designs, and creates, and which is of more importance than any and all of the others.

Boyle says that mechanics, in a larger sense, is for those disciplines that consist of the application of the pure mathematics to produce or modify motion in inferior bodies.

Huxley says, in the *Nineteenth Century*, "Newton defined the laws, rules, or observed order of the phenomena of motion which come under our daily observation with greater precision than had been before attained, and by following out with marvellous power and subtlety the mathematical consequences of these rules he almost created the modern science of pure mechanics."

Newton, in the preface to his "Principia," says, "The ancients made great account of the science of mechanics in the investigation of natural things, and considered mechanics in a twofold respect,—as rational, which proceeds accurately by demonstration, and practical.

"To practical mechanics all the manual arts belong, from which it took its name.

"To describe right lines and circles are problems, but not geometrical ones. The solution of these problems is required of mechanics, and by geometry the use of them, when solved, is shown. Therefore geometry is founded on mechanical practice, and is nothing but that part of universal mechanics which accurately proposes and demonstrates the art of measuring. Rational mechanics will be the science of motions."

He finally says, "I wish we could derive the rest of the phenomena of nature by the same kind of reasoning from mechanical principles."

Thus you see this great master's high estimation of mechanics, and he clearly shows that geometry and mathematics are the two simples that, when combined, give a result that has builded worlds, and without which Newton could not have discovered gravitation, nor could Kepler have formulated his "three laws of motion" which regulate the universe of suns and stars.

Tyndall said of Goethe, in scientific pursuits, that he was so devoid of mechanical principles and the minute details of the powers of construction that he was an ignis-fatuus, and unworthy to be followed.

What gave to the Egyptians the glory that to this day crowns their everlasting works in architecture and their tombs? Mechan-

ics. Their monuments have never been excelled in perfect symmetry and beauty, and their pyramids show no lack of comparison in their calculations in the distance of the sun from the earth with the astronomers of to-day.

Where would they have been in history but for their mechanical productions, that promise to continue for thousands of years? What does the history of all nations have to show of greater interest and more lasting in its results than the mechanism displayed by its peoples? What could Napoleon have said when in Egpyt with his army at the foot of the great pyramids that would have created more enthusiasm than when he most poetically exclaimed, "Forty centuries look down upon you!" What if he had said the work of one hundred thousand poor mechanics, hod-carriers, stonemasons, carpenters, blacksmiths, and artists look down upon you? Go ask the architects of all those wonderful temples on the Nile how they moved those immense granite blocks from the quarry, and how raise them until pile on pile had massed a structure, the mode of doing which the wise mechanics of to-day cannot explain?

Ask the Roman Cæsar what gave him his power in battle? How could those magnificent pieces of masonry have been accomplished but for the skilled mechanics? Coming down to our own times, where is Watt? He lies entombed in Westminster Abbey, by the side of all that is honored in literature, art, science, and war. He was a mechanic!

Sir Christopher Wren. Is his name not upon every lip? What could he have done as a great architect without his inspired mechanical ability?

What has the printing-press done for mankind? It required a mechanic not only to make the type but the press. Is there any monument to the maker of these? Yes. Where is the monument to the dentist?

Morse needs no monument to tell those who may come four thousand years hence of the apparatus invented by him.

Ask Franklin, that universal genius, whether he would wish us to call him a mechanician?

We can ask the *Freemason.* His craft has come down to us through the course of time. No record shows its beginning. We see it to-day in man's memory only as it was in the inception. No tablet has written upon it a word to show its secrets, and yet they are emblazond on everything from the bottom to the highest pinnacle of the Mason's work. "Geometry is Masonry upon a general scale." Who does not consider it a high honor—the

highest—to be admitted into its hallowed courts? Who of you that have officiated in its halls and chambers but is impressed at every "step" and every "halt" of the sacredness and importance of the science taught? Labor is engraven upon every panel of the doors that stand guard at "Who comes here?"

Ah, my fellow-members of the dental craft, how much longer will you persist in your ignorance and stupidity? I cannot lose sight of the days in my youth when I once made the jack-plane curl up the shavings to my delight, and how I turned these hands to account in the carpenter-shop, or the cabinet-makers' department, and when I could help to build a house, make a cradle or a coffin, chisel out a gun-stock, or make a blacksmith's or a church-organ bellows; or when there was nothing of this for me to do, I could go into a country store and measure the molasses or the calico. I am glad now of that varied experience.

I am very proud of mechanics when I look around and see men in dentistry who were once poor carpenters, and others engaged in other forms of mechanical trades, attempting to relegate mechanical dentistry to the shades. I feel sure that they never became masters of the art.

For all that is "true" in mechanical dentistry, what, on the other side, is false? We hear of little else at the present time but "science." They attempt to put down every man who has anything to say upon any other subject, and remind him that "if we would elevate our profession" we must take up the subjects of Remedies and Bacteriology. We must no longer fill teeth and resort to the mechanical manipulators.

Professor Miller, of Berlin, in an article read before the Southern Dental Association in 1890, or 1891, spoke of Arthur and Bonwill, who were the advocates of mechanical skill in dentistry, and asserted that it was not scientific to do as they were doing; that the mechanic had no place with the scientific men.

A better example cannot be given than the action of the four honorary American presidents of the International Medical Congress in Berlin, in 1890, Dental Section. The Committee on Essays invited me to read a paper on the Geometrical and Mechanical Laws of Articulation, with the understanding that I was to be there in person. I wrote to two of the honorable body in regard to it, and was advised by them to decline and not be present at the Congress; that I had sufficient honor in having received an invitation. I asked the reasons for such advice. Their argument was that Bonwill was not a scientific man, nothing but a mechanician and inventor, and

was working his brain for all he could get out of the profession. A third one, who was interviewed by another party for me, said that they did not wish to have any dentist who could not talk pure science; that at the International Congress in 1880 in London, and at Washington in 1886, the foreign dentists had proven too much for the Americans, and demonstrated their inferior ability in practical scientific work, and that no man would be invited before the Berlin Congress unless he was a good scientific man.

Sir Astley Cooper said that medicine is a science founded on conjecture and improved by murder.

And so bacteriology in dentistry has not yet saved the first human tooth from the ravages of caries, nor has it in the future any bright ray of hope that it will accomplish all that the scientific dentist would have us believe.

If working our brains over such hypothetical problems will make us scientific dentists, while we are permitting the teeth to go to destruction through our present practice, let us hail it; but, at the same time, we would do well not to ignore that true branch of science—mechanics—which has from the inception been the only fixed and certain basis of attacking and battling with caries. We cannot practise the science of dentistry when we attempt to throw overboard its sheet-anchor,—*manual labor.*

So long as we cannot save human teeth by the theory of "germ treatment," but are compelled to labor with our hands, we are doomed to be looked upon as craftsmen and no better than the trades.

The mere experimenter, without any definite results in any line of work, is not a scientific man. Science is absolute and unchangeable. It is truth! It is an ultimate principle! There is but one result.

I would not have you understand that all experimenting in the secret chambers of nature should be denied. But what I do protest against is, that when scientific men have failed to save human teeth by certain known and acknowledged treatments and practices, they should assume to be the umpires to decide whether the present system, founded almost entirely upon mechanism, should be set aside.

When the teeth become so worn, where germs have had no part in the destruction, what can we look to as our alternative? Bacteriology?

The mechanical dentist is a fixture in our profession, and it would be well to make yourselves competent to be experts in your

art, that you can stand in the eyes of the best of society on equal footing with the jeweller, diamond-setter, and cutter. The electrician could not do his work without the steam-engine to drive his dynamo.

The field of mechanical dentistry to-day is unique; and, while we have no system that has been universally adopted, we have done enough to place us as far on the record of progressive dentistry as has the so-called operative department.

While I am no friend to bridge-work as practised, yet it has taught a few men what we so much stand in need of,—manipulative skill.

Crowning has been one of the greatest steps in dentistry so far as pure artificial and mechanical work is concerned; but even this you will find has been most wofully abused by many of our craft, in cutting off the crowns of natural teeth that could have been saved with amalgam for years.

The truly competent dentist who is a born mechanician will seldom have to resort to a crown of any kind. The more we look at the subject will we find that dentistry is a medley, and no man can be competent to practise it who has not been educated in all its departments to do one as well as another.

What is it that will place us among the world's exemplars, and give to us, when dead, a place worthy to be remembered? One man from our ranks has been honored by a public monument, the discoverer of anæsthesia; and if it had been raised while he lived, I am not sure but he would have been abused that he did not give at once his discovery.

The first step to recognition by the public will be when we have, as I have intimated, sought truth for its own sake. Selfishness, envy, jealousy, and ingratitude can have no place in a body of men who labor for the general good. Let us be fair and, when one of our craft has given something original, and it proves a marked advance, place his name, while he lives, on the record. It will be in time a milestone in the records of dental history.

The next most important step is for the live men of our art to visit the great centres of trade and where machinery is developed, and watch the matchless system by which the minutest part is made, and also made interchangeable. Go into the draughtsman's department and scan each line and curve on that chart, where lies in perfect symmetry every portion of the huge engine to be born of that engineer's skill. Go and see it put together, and note whether every bolt and pinion does not fit with absolutely mathe-

matical precision. System, order, conception, design, creation,—without these all would be chaos. Without the laws of geometry and mathematics, with a genius to carry these out and with the perfect system of "interchanging," and machinery adapted for every special piece, they would be as helpless as is the so-called scientific dentist of the day. I never enter a machine-shop of the simplest character that I do not feel a reverence for men who labor and wait for recognition.

We are very far from a system that will enable us to save, with our present means, the teeth that come to us for treatment. The "American System" had no head, and it entailed upon us much that was merely experimental, to fill pages and make volumes.

I think that it was an unfortunate procedure when Dr. was first placed as a title to our names. It is like a big solitaire diamond on the hands of a man who has to labor, whether in dentistry or the trades; he cannot keep his eyes away from it. Nor can he lose sight of the fact that his hand or finger must be placed so that every one else can see it. I appreciated it as much as any one when by certain laws of the colleges a diploma was given me, which I never looked at until the officer demanded it for registration. I would prefer to have on my sign, as on my cards, my simple name.

Professor Samuel Gross said to me, "Do not complete your medical studies at the Jefferson, where you have one course to your credit, for the purpose of being with M.D.'s. Go on in your own way, and do all you can to elevate the systems of practice. Patent what you have a right to, as well as M.D.'s who copyright, learn to converse with M.D.'s intelligently on most subjects, particularly in dental practice, and I assure you that you will stand as high with us and better than a dentist who could talk medicine from the book, and with no practical experience to show in conversation."

My associates, I will not trespass longer upon your patience and feelings, but remind you that if you will but read over my article, you will find that, although not scientific, it points to the goal where we can see truth. Let us as a society, see what we can get together and place in order to show how far we are standing in the advance, and what its members have done, and place it in the Columbian Exposition, that we can measure, not swords, but the ploughshares we have made which will turn a sod that will, even when harrowed by opposition, give us a pride in our past work; and whether

we are recognized as being the peer of any or forgotten, we have the consolation that

> "In doing is reward, and richest he
> Who labors not for time, but for eternity."

DISCUSSION.

The President called upon Dr. Truman to open the discussion.

Dr. Truman.—There is not much to discuss in the paper, as I view it. I think we can agree with Dr. Bonwill that we are all mechanics in one sense, but because we are so it does not follow that we are not professional men. We can combine the two. I do not regard it possible to practise dentistry without being scientific, —without being something more than a mere worker in tools. A single tooth in the mouth cannot be treated without understanding the very science derided here to-night, and the moment the operator steps aside from that, just at that moment he is a failure in dentistry. To me the argument made is simply a plea for a special line of work.

We belong, I believe, to a growing profession, and I hope to see it develop into one of the great professions of the world. I believe we have in this work very much that is truly scientific,—more involved in it that is good for humanity than almost any other. Medicine is not science; never has claimed to be. There are specialties in medicine that are truly so, and ours is one of them. I contend that we, as dentists, have just as much right to the title doctor as any man in medicine. I am unwilling to lower my flag to any medical man, no matter how skilful he may be.

To practise our profession, we must be mechanics, and I am proud of it. I can never look at one of the great buildings in this city without veneration for the man that has reared it. Standing under the dome of St. Paul's, London, I could feel the power of the individual that laid one stone upon another, but because I thus feel is it required of me that I should abandon the position gained by greater effort? I object to it.

It is no wonder Dr. Bonwill did not value his degree; he never earned it. If he had gone through the schools day after day, sitting on the hard benches, and had studied along with others, he would have appreciated the feeling all have as students and as co-laborers. He came into the profession through another door, and there I leave him.

Dr. Leffman.—I do not know that I can add anything to the dis-

cussion. I feel very much as Dr. Truman does, that there are two sides to the profession, which certainly is regarded generally as a mechanical one.

I do not agree with the inferential condemnation of purely scientific students, which I gather from the paper. I believe the advances made in bacteriology have been of great value, although it may not at the present moment appear quite so clearly to everybody, particularly with practical men, who have learned to deal with problems in the operating-room. I think it is of great value in modifying the methods of dentists.

When the bacteriological discoveries were announced years ago they were smiled at by many, but are now acknowledged to be of value. Even the late development and discovery of lymph, as it was called, after passing through a period of contempt and condemnation, is now coming to be recognized as a most valuable aid in the treatment of a most formidable affection. The work of research in our practice is not as brilliant in its results as some other departments, by reason of the narrowness of the field, but it will certainly have its effect. I have myself, as a teacher in a dental college, been interested for years in everything connected with its advancement, and I therefore cannot deny that a large part of dentistry is mechanical, as it is also a part of surgery. The most brilliant work of surgery is of that character, but we must not overlook the purely professional feature.

I am inclined, therefore, simply to second Dr. Truman's remarks that the dentist is entitled to the degree of doctor, and by encouraging the development of the dental student, and giving him something of a professional standard to attain, we develop his usefulness and make him far more serviceable in the practice of his profession.

We may leave the purely mechanical features to their natural development. The human mind, especially the American, runs largely in that direction. I do not think we will have any want of improvement in this by reason of any development of theoretical or professional features.

Dr. Jeffries.—It seems so me that the key-note has hardly been struck, or, at least, I haven't heard anybody take the position I think the question should occupy. Dentistry, as practised at the present day, is something that stands entirely by itself. It is professional; it is mechanical; it is artistic. You cannot practise successfully without bringing all into use. An exponent of the art in the highest degree must have attributes which every man cannot possess. He must be thoroughly learned in manipulative skill, which

he can only acquire by proper teaching in his college and in his office; if he has cases to regulate, it will require the highest degree of mechanical skill, and it does seem to me that to call it either the one or the other is a mistake, as it will need both to make it a success.

Dr. Darby.—I think Dr. Bonwill was pleading to-night for only one side of the question. I do not think that away down in his heart he repudiates the theoretical part of dentistry. He was talking on only one side of it. We all know that it is out of the abundance of the heart the mouth speaketh. He is a mechanical inventive genius, and it is natural he should dwell in that direction, but I do not think he repudiates the idea of the value of therapeutics or bacteriology in the management of dental lesions or in the treatment of teeth. I should be very sorry to think he was so biased in one particular direction, or that he had so little sense, if I may say so, as to wish to bring that paper as an epitome of the intelligence of the profession. It certainly is not.

Dr. Guilford.—I doubt if Dr. Bonwill expressed himself as clearly as he might have done. When making his special plea for mechanics he seemed to think it was something separate from science, which is a great mistake.

Dr. Bonwill is well acquainted with mechanics, especially dental mechanics, but he never did a single thing, he never invented any instrument, without there being science at the bottom of it. I don't see how the two can be divorced. They belong together. There is not a motion in mechanics but has associated with it the elements of science; so that when we consider the dental profession, I think the majority of us would not be willing to agree to what Dr. Leffman has said, that it is a specialty of medicine, and we are rather inclined to call it a branch of the healing art.

There are certain things connected with the practice of dentistry which make it different from any other profession or calling. We treat cases as medical men to a limited degree. We are mechanics in filling teeth or making a plate. If we do our work in an artistic and skilful manner, if we perform all the different things we are called upon to do, I cannot see why we are not scientific and artistic, because both of them are really connected in mechanics; so that I should say that the professional dentist includes not only mechanics and art, but science also. Some of the work is very difficult,—more so than much of that done by some of our sister professions. The surgeon's amputation of a limb or removing a bone requires a certain amount of manipulative skill

and scientific knowledge, or it could not be done successfully, and yet we have surgical work that is more difficult than the removal of a bone, setting a limb, or amputation.

Take, for instance, the branch of orthodontia where the positions of the teeth require changing. It seems to me that this includes all the different elements we have been speaking of to-night. Appliances must be made to move the teeth. The lines of force must be exactly known, and also the power of resistance and the correlation of forces. Is not all that scientific? Does not that introduce mathematics in a very large degree. And when a tooth is to be moved, it cannot be performed as a surgeon would, by a simple surgical operation. It must be accomplished in a very slow manner indeed. Forces must be applied, and certain changes must be depended upon which will enable the tooth to move. It has to be performed with skill, care, and caution. After that we are obliged to retain the teeth in place. So I believe there is more difficult surgery involved in the correction of a case of irregularity than in the amputation of a limb.

Dentistry occupies a very large field and brings in different sciences and arts, and if this be true I think we occupy a position by ourselves. Anything that is made up of science and art is a profession, and it is nothing else.

I agree entirely with Dr. Bonwill's plea for mechanics, but I think he has not made it broad enough, because it includes a great deal more than that. He spoke, too, of the fact that students were not willing to take up the mechanical part. That is certainly true to a large extent, and I think that difficulty has been recognized by the teachers of to-day, and arrangements have been made by which they shall be taught this branch more fully than they have been before. I know it is so in many colleges; it may be so in all. As soon as a want or a deficiency of that kind is felt, arrangements are immediately made to remedy it, to turn out, if possible, better and more scientific and skilful dentists than have ever been graduated in the past.

Dr. Bonwill.—In answer to criticisms and remarks made by the members, I have to correct the very false idea raised by most of them that I could not see that dentistry could be more than mechanical. While I can count upon my fingers the number of my medicinal remedies, I am not lost to the fact that a man should be well educated and have passed through a medical training, not alone for the remedies used, but for the higher culture it gives to one, and for the better understanding the laws of inflammation and

the aseptic treatment. The remedies are very few that are actually needed for any and all the diseases of the teeth and adjacent parts, yet they should be intelligently understood to be made effective.

What I mean is, that above all else we must admit that mechanics in dentistry is the basis of nearly all our needs and successes, and that when we would sink this principle out of sight, fearing to face the world with such a name, we are doing that which is unworthy of our calling.

Much stress has been laid on the treatment of caries by asepsis, as if it were the *sine qua non.* Professor Tait, of Scotland, demonstrated that he had greater success with cleanliness than by the medicines for aseptic treatment, and Professor Lister had to acknowledge at Berlin, in 1890, to the mistake he had made in attributing so much to carbolic acid and antiseptics.

I would not for a moment have you simply be a mechanic in dentistry. In dealing with the human economy we must have as much information from study as will enable us to put our mechanical skill to the proper use; law cannot be successful unless a man has ingenuity or power of construction.

Invention gives in this line of work a power not attained outside. We cannot deny that should we lose our hands we would be helpless. Manipulation is mechanical dexterity, and let us call it by the right name,—not *prosthesis.*

THE regular meeting was held November 13, 1892, at the rooms of the Society, 1228 Walnut Street, Philadelphia, Dr. Louis Jack presiding.

After the transaction of the usual routine business, the discussion of the evening took place on the question, "Should Examining Boards have the Power to grant Certificates to Undergraduates?"

The subject was opened by a paper from Dr. Jack.

SHOULD EXAMINING BOARDS HAVE POWER TO GRANT CERTIFICATES OF QUALIFICATION TO UNDERGRADUATES?

BY LEWIS JACK, D.D.S.

THE question is one of extreme consequence to the cause of dental education, and demands from us and from any body of dentists essaying to discuss it the most careful, exhaustive, and judicious consideration. The wording of this question probably does not go sufficiently far. It should have included in its verbiage the further inquiry whether the protective influence of law should cover any form of qualification for practice except that which is given by compliance with the fullest curriculum of the dental schools. In other words, the term undergraduate should include every one who is not a graduate of a dental school. Such was the intention in the mind of the proposer of the question.

Therefore my argument before you in opening this discussion will include both classes of those who may apply to the Examining Boards, and those who have been self-taught, and those who have attended one or two courses of instruction.

I have examined the laws of the various States, principally as they are reported in Rehfuss's "Dental Jurisprudence," and find the following States give any person the right without qualification to demand an examination as to their attainments,—viz., Alabama, California, Colorado, Delaware, Georgia, Illinois, Indiana, Iowa, Louisiana, Maine, Massachusetts, Michigan, Mississippi, North Carolina, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, Wisconsin.

The following States qualify this privilege by requiring evidence of previous study: New Jersey makes five years' preparation a necessity. New York if a "period of four years of regular study has been pursued." North and South Dakota each require "three

years' previous study under the supervision of some regularly practising dentist."

The States which do not examine such persons are Arkansas, Kansas, Kentucky, Maryland, Minnesota, Missouri, Nebraska, and Ohio.

It is thus to be observed that the laws of twenty-eight States permit the examination of non-graduates, and that those of eight States do not authorize the examination of persons unqualified by the various schools.

The fundamental principle concerned in the requirement that the Examining Boards may give certificates to practise to those who are not regularly qualified, is based on the probability that there may be some who have made the necessary preparation to render intelligent service, and who may not have enjoyed the advantages of school training, and that, therefore, these should not be excluded from the enjoyment of the inherent right of man to freedom in the pursuit of business. The probability of the existence of such a class of persons, even in the most intelligent communities, is so remote that the injury caused by the relinquishment by the public of the right of any person to an examination is slight in comparison with the damage which may be inflicted by its retention. This being so, there can be no great importance to be attached to the existence of this privilege.

From the experience of the past, the liability to leniency of the Examining Boards granting certificates of qualification to indifferently prepared persons is a constant menace. It is a source of contention by the teaching Faculties and a ground of contempt for the boards. The fault is in the law, of which the boards are the executors; but the fact remains that Examining Boards invest men with the rights which the Faculties consider three years of exhaustive study as no more than sufficient to prepare them to enjoy.

The general purpose of the dental laws, which have become of nearly universal enactment, have for their first effect the protection of the public from the injuries which may be inflicted upon the members of it by incompetent persons. The immediate secondary result is to induce those contemplating the pursuit of dentistry to make the necessary effort and personal sacrifice of time and money to pass through the required steps to secure thorough training. The result of the latter force is what has been in the minds of those who have proposed and brought about the approval of the dental laws. For this reason these laws have been a benefit to the public, an unmeasurable advantage to the schools, and have proved

immensely beneficial to the character of dentistry as a liberal pursuit.

The presence of the principle, however, that any person may come forward and submit to an examination has had a demoralizing effect upon many who, without this opportunity, would have had no other course open than either to undergo a college preparation or abandon the attempt.

No one can indicate how many have in the various States carried on their attempts to practise with the vain hope that they could prepare themselves for examination, and have in the mean time gone on surreptitiously practising when there appeared little danger of being disturbed by their neighbors.

My views upon the next to impossibility of any person of the class indicated making a creditable examination have been long entertained, and have become strengthened by my experience on the Examining Board of this State. In the two terms I acted not a candidate could, on my subjects, answer correctly the most elementary questions. For instance, on the subject of dental histology, I have yet to get an approximately correct reply to the question, "What is the character of the structure of the mucous membrane?" Of course the genesis of tooth-tissue can have no place in the mind of a student who cannot answer this query. In dental anatomy I have yet to receive a satisfactory definition of the three hard structures which enter into the teeth. From my examination of such candidates I have been forced to the conclusion that the examination is simply useless, and that the requirement that boards shall entertain their demands is a waste of time. It is objectionable because it is unreasonable in the face of the facts; it borders on the absurd because it is fruitless.

In too many instances, when persons of this class have been given the certificate to commence or to continue practice, they have been an injury to the neighboring practitioners in ways scarcely necessary to recount here.

There remains the further question of the injustice of such persons being admitted to practice. The college student who has spent his two or more years at a large expense in a distant city for qualification finds himself confronted by another who has the same rights under the law, who at a few dollars' outlay has procured this privilege and protection, and who, not having the air of professional honor about him, has poisoned the atmosphere in various ways by degrading methods of conducting practice, accompanied in some instances with the pretension that the certificate gave greater claims

because it was the result of an examination by a board of men under the authority of the State and the auspices of the State Dental Society.

This much being stated should be sufficient to conclude the question of the impropriety of this qualifying process.

While it may have had some justification in the early legal regulation of dentistry, since at that time it would have been difficult to procure legislation without granting this right, it certainly is not in consistency with the views of leading men. The new laws as they are amended should withdraw this privilege. That it may be done is conclusively proven by the fact that, as alluded to above, eight States require graduation as a qualification to enter practice; and as no legal question upon this point has arisen, so far as we are aware, it may be taken for granted that no impediment has been encountered.

When we come to another class of persons, those who have attended two years of school training, who may be offering themselves ere long in the States which are required to examine any who may present for certificates, the discussion assumes a still more serious aspect.

The expression of opinion by leading dentists that the curriculum of the dental schools required enlargement and the period of study extension, with the concurrent action of the schools and the Association of Dental Faculties to the same effect, resulted in improved courses of study in some of the schools, and the enforcement by the Association of Faculties upon their associates of the three-years' term of instruction. This enlargement of the course of study had the support and encouragement of the National Board of Examiners, and marks an important advanced step in dental education. The danger of this action being weakened by the obligation of the Examining Boards in so many States to make examination of any undergraduate who may present for this test, makes the question now before us an extremely important one. It is readily perceived that it will tend to weaken the cause of dental education, and is a menace to the three years' course of instruction. How far students who have completed the second year may attempt to shorten their period of instruction by resorting to an attempt to procure certificates of qualification by applying to the boards for an examination is an uncertain factor, but the probability of such a course, even the possibility of it, should occasion alarm to the friends of extended dental education. The opportunity for the accomplishment of such a result is a

menace, and needs the correcting influence of public opinion to remove the chances.

The general tendency and the undercurrent force of the dental enactments regulating the practice of dentistry is to bring about improvements in the dental curriculum, to increase the importance of dental services and enlarge the self-respect of those engaged in practice. In view of these important ends which are involved, it is extremely illogical to entertain the propriety of examining undergraduates in the manner indicated. Such a course would be begging the whole question of dental education, and implicates every one who is concerned as a participant in curtailing the benefits to which every honorable man, who regards the good of his profession, is committed.

The injurious effects upon the morale of the dental profession would appear a greater evil than the examination of mere novices.

It would produce distrust of the Examining Boards upon the part of the Faculties, would weaken the integrity of the individual offering himself for examination, and being so inconsistent with the tendency of the times which demands more exacting preparation, that mental confusion and moral distress must be the inevitable result.

Examining Boards may have an understood policy which may render it difficult for any one to pass their ordeal, but it appears there can be no safety for the schools of the dental profession until the laws are modified to make it impossible to get a certificate of qualification from a Board of Examiners alone.

As the schools are now entering upon the regular three years' course of study, there is abundance of time for the various State societies to make application for such amendments of the dental laws as will repeal the privilege of examining non-graduates.

Certainly it cannot be too much for this Society to express its sentiments to the Pennsylvania State Dental Society, through its committee on dental laws, that the new or amended law about being prepared for approval in Pennsylvania should include such provision as will remove the privilege to grant certificates of qualification to any person who is not a graduate.

A similar request sent to the officers of the various State Dental Societies would also be of service to the same end.

This subject will be presented to the many local societies for discussion in the same form it has been given to this Society, and while it is a fresh topic is the proper time to give it prominence by an endeavor to produce concurrent action in the States which will benefit by the proposed amendment.

DISCUSSION.

Dr. Peirce.—I rather hesitate to express my views on this subject, as it is a matter of some delicacy, inasmuch as I am connected with a school, and it may be somewhat warped with my associations. There is one thing we need to remember, and that is, not to confuse incompetent Examining Boards with competent ones.

My views are that competent Examining Boards should be thoroughly prepared to examine and say whether the applicant is qualified to practise dentistry. If we have these, they are for the purpose of judging of the qualification of applicants. They have no right, in my estimation, appointed as they are by the Legislature, to ask the applicant whether he has a diploma, or where he got his education. All they want to do is to ascertain if the applicant is qualified to practise dentistry, and it matters not where that qualification is obtained so long as he possesses it. While I have that feeling, still I concur in the sentiments of the paper as to disqualification of applicants who have come up before the board; yet the fact still remains that the law has no right to ask the question, where the information was gained. It is simply whether the information is possessed by the individual, and I would like our board so educated and so thoroughly appreciating their position that they should hold that ground, and not accept a diploma as a guarantee, and not accept anything but a thorough examination and satisfactory qualifications, and when we have that the public is protected, and we have an advance made in education.

I concur fully with the opinion expressed that applicants for examination are invariably disqualified. I have no hesitation in saying that, and that three years in college would not be too much instruction to require, but the fact still remains that the Legislature, in passing a law and the State in filling the Examining Boards should make those appointments with the view to the Examining Board being qualified, thoroughly qualified and conscientious, and if they were all like our president I should have no fear in the matter.

Dr. Kirk.—This is one of the subjects, I must confess, in which I have only a limited interest. This centres so much in other directions that I have not sufficient to go around.

If I understand correctly the statements made on this subject, that in the effort to obtain State legislation regulating the practice of dentistry, the committees have been met by the problem, the relation of State Examining Boards to college Faculties. The Constitution of the United States and the laws of the various States are re-

pugnant to anything that looks like class legislation, and a law which would prohibit any man from practising dentistry, unless he was a regular graduate of a dental institution, would savor of that idea. Dr. Peirce has very clearly shown that when he states that such legislation would inhibit the class who wish to become self-educated. As a matter of principle, I don't see any objection to saying whether a man should not qualify himself to practise dentistry. The question is, Can he do it? It is the function of the State Examining Boards to answer that question.

I was on that board for two years, and had charge of the chemical and metallurgical examinations, and I know that the men who came up were absolutely unqualified in the most ordinary way, and certainly unfit to practise dentistry if they were to be gauged by that standard.

The State examination, if it is properly conducted, should be the barrier to the entrance of incompetent men into dentistry. Whether we should or should not examine men who have not passed a college examination, it seems to me hinges on that point of the law in respect to class legislation.

Dr. Darby.—It seems to me the injury is to the student himself. It is not unusual for a man to enter college, and, after he has received a smattering of dental education, he concludes to continue the work at home. He practically says, I can work with my preceptor, act as an assistant, can study a little, and, putting what I have learned in college with what I can learn at home, I can manage to pass this Examining Board. He perhaps succeeds in this, and enters into practice, but he has not that broad culture, that many-sidedness that he would have had if he had remained two years more at college, so that injury reflects upon himself, and he is the sufferer.

Now, that is practically the main question. I was eight or ten years with the Examining Board, and among the applicants were men who had attended one course of lectures. They were, perhaps, well up in some of the branches, were really quite well qualified in operative dentistry, so far as answering questions. It was usually upon that branch that I examined, but they were not, and never would be by home study, what they would have been if they had attended one or two years more at college. So I believe the State Board, or the certificates granted, are an injury to the men themselves, and if we were to prevent that manner of granting certificates by State Boards, numbers of men would be better off in the end. Those who want to study and enter the profession will always find a way, and while it may seem almost impossible to raise the

money, it can always be done if they are in earnest. Therefore I am opposed to the State Board.

Dr. Guilford.—The remarks of Dr. Peirce pleased me very much, and he covered, I think, the ground very thoroughly. This is an important question. As the law now stands in various States,—our own among the number,—the State Board is required to examine any applicant, and if he be found qualified to practise, they must give him a certificate to that effect. The question is, whether this shall be continued or whether the law should be changed. Dr. Jack has given several reasons why the law should be changed, and there is something to be said on both sides. The student, at present being required to take a three years' course before graduation, finds at the end of the second year, perhaps, his funds are exhausted, and he is not able to continue through the next course. The question, then, is, Shall he have the privilege of practising a while in order to raise funds to complete his education? The only way of doing that is to appear before the board and pass the examination. If he is prepared to pass, if he correctly answers the required number of questions, I cannot see why he should not be allowed to practise. The board stands as a guard to the public against incompetency. If the man is not competent, it is the duty of the board to find that out and reject him; but if they cannot reject him, certainly, I think, they must give him the certificate. I fail to see any fault to be found with that.

Another question is, Is it not true, or probable, that a student, after having attended two full courses in a reputable dental college, is better qualified to practise than many men who have passed the board in the past? If a student of that kind is qualified, and has been in attendance at two full courses of lectures, and passes the examination before the board, I cannot see why he should not be admitted to practice. I am willing, so far as I am concerned, that the law shall be changed in that respect. I fail to see any real objection to it.

As to Examining Boards, we have them of all sorts. That is proved by the fact that before certain boards it is almost impossible for any man to pass. Some of them have rejected men who were considered by the colleges very well qualified. That has happened time and again. On the other hand, students who have only attended a single course in college have passed the boards in other States. Two in our own college, and one the year before, went home at the end of the first course, and, desiring to practise during the summer, went before the State Board and passed the examination successfully. Now, that shows, I think, that the men who exam-

ined them were incompetent to do so, and it shows us also that there is the greatest degree of difference between the State Boards.

Now, another point, and that I think was in the mind of the essayist to-night, and that is that perhaps a student who had attended one or two courses of lectures and had appeared before a State Examining Board, and had passed that Board, would not complete his education in college. There is a probability of that taking place, but I have never known it to occur. In the cases under my observation they have simply passed the board for the purpose of practising a certain time, and then continued their course; so it has not acted injuriously in that respect.

It is very well for us to have laws regulating the practice of dentistry, but it seems to me we ought to go back of that and have something to say in relation to the composition of the boards,—what sort of men shall be in them, and what their proficiency shall be for examination, what the requirements shall be and the way of examining, and that it should be somewhat uniform and a method of comparison between the boards. It seems to me that as it is now done it is very loose. The colleges make strict requirements, and more restrictions are being placed upon them each year, while with the Examining Boards there is no restriction.

There is another question, that of examining men who hold diplomas. That has hardly come up. The point I want to make is, in the first place, under the law as it now stands, different boards are required to examine any one who comes before them, and it seems to me it is not working any special harm. If a student is qualified to pass an examination, he will certainly inflict no injury upon the public.

Dr. Truman.—I find very little in this question. I have been astonished at the first and last speech. Here is a dean who is not satisfied with the teaching of his own school. He wants the diploma discredited by having the board re-examine the students. It is astonishing to me. I do not care to have any board examine a graduate of the University of Pennsylvania. I question their ability to do it. I am opposed to this granting of certificates, and I am surprised that my friend, Dr. Guilford, should defend a practice that will certainly end in discrediting dental education. It would be better to return to the old plan of every man studying in private and securing a certificate from his preceptor. The majority of boards may or may not be good.

This plan of granting certificates in some States has superseded the diploma. In a recent contest in New York State, in granting

honorary degrees, it was asserted that a degree in New York State was superior to a diploma. If it has come to that, that a certificate issued by the State is superior to that granted by a college, we might with propriety give up all college instruction. A man can go to New York State and get his degree, and can then become a professor. And why not under the law? Is that an advance in education? I think not. I am opposed to the whole thing.

Dr. Peirce, in reply to Dr. Truman, said: The question under discussion is not whether incompetent boards should have the power to examine students. It is whether Examining Boards shall have power to grant certificates of qualification to undergraduates. We have to presume that the board has been legally appointed and has the qualification. We have to assume that in discussing the question. It is, simply, should Examining Boards have power to examine? If they have been appointed by the Legislature for the purpose of protecting the public, what else should they do? There is nothing else to say. They must have power to grant certificates, or else they should not be appointed. It is not a discussion of whether they are qualified. I should say, with Dr. Truman, there was not a fourth of them qualified to grant certificates, but if they are selected, it is their function, and, having been appointed, they have that power.

Dr. Guilford.—I am afraid I didn't make myself entirely clear. I judge so from what Dr. Truman has said. He seemed to catch the idea that I was in favor of the old method of examining a lot of men,—anybody at all,—and passing a good many of them and allowing them to practise without a regular dental education at the colleges. My idea is that it would work no harm as things are now constituted. The Examining Board of to-day in the different States is very different from ten years ago. They have learned a great deal, and their examinations are of a very different character in many of the States. Now, if a student or any one else comes before an Examining Board, it is their duty to find out if he is qualified, and if not, to reject him, and that is the end of it. If he is qualified, I don't see how he can be prevented from practising. I think it is the reverse of preventing men from going to college.

In the early days persons who wanted to practise would appear before the Examining Board, and if not qualified they would be rejected, and they knew they could not possibly practise in the State; the only thing to do was to go to college, and this they did. Dr. Peirce will remember that was the regular course men took. They found they could not pass the Examining Boards and they

qualified themselves properly in colleges, and I think that is exactly the effect it would have to-day, and I am sure the examinations are more stringent than they were then. I would not be in favor of men entering the profession outside of the schools; in fact, I am in favor of a law requiring them to pass through a school and obtain a diploma, but at the same time I see no harm in allowing students to pass between the courses.

Dr. Darby.—I think what Dr. Guilford has said is partly true and partly wrong. He says that men who pass the examination before the board do not come back to college. That very result, in my opinion, injures the man. If he succeeds in passing the Examining Board he goes into practice without that culture he would get from a second or third course in college, and for that reason I am opposed to it.

Dr. Idck.—I might state a subject that will be of interest. In the earlier days we experienced as a result of our work very considerable complaint in reference to the number of men who received certificates of qualification from the board, and a resolution was passed at the State Association in which it was asked to appoint a committee for conference with the Board of Examiners to see if some means might not be devised by which a certificate of qualification would be made more difficult of attainment. After that two new members were put upon the board who were pledged to a strict examination, and when the board made up its organization the president announced that the incoming of the board meant a complete change in the policy of the board, and that certificates of qualification should not be granted unless they were most clearly deserved, and rules were adopted which made it very much more difficult to secure a certificate.[1]

While I am on the floor, I might state that a few words are necessary on my part to clear up one part of the argument. It is certainly true that in all these twenty-eight States the boards are obliged to examine all who come before them. The question brought before us here is, though, Should the boards have that power? Should the law give that power to the boards? would possibly have been a better expression to have given the question. Should the law confer upon Boards of Examiners power to grant certificates without college qualification?

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[1] From 1876 to 1885, inclusive, twenty certificates were granted by the Pennsylvania Board. From 1886 to 1892 two were granted. This difference indicates the advanced ideas of the board.

NEW METHOD OF CLASPED PLATES *VERSUS* MOVABLE OR UNMOVABLE BRIDGE-WORK.[1]

BY W. G. A. BONWILL.

TIME, with experience, levels all things. How one's practice will be changed if truth be uppermost!

I am surprised at the many summersaults I have made in nearly forty years. Because the Fathers said "*Don't*," I did as they bade me, and should yet, perhaps, if I had not been made of the material of which revolutionists come.

At one time I would not put in an upper plate without a suction, and never a lower one with a clasp.

For eight years gold and tin were used, but never amalgam.

The uses of contour, at first, I did not see. Its beauties were more apparent when kept out of sight. Also artificial dentures and flat grinding-surfaces. All through my early practice I was afraid of offending the Fathers, and it caused me much sorrow and heart-ache and kept me in poverty and made me work harder than a galley-slave.

But live as long as you may, there are to be found many young as well as old persons who say "Stop" to every new advance. Do not mind them, but strike out boldly for yourselves and humanity.

In one thing I never have changed from the beginning of my career, and that is, never to sacrifice a tooth without a struggle for its existence. A human tooth has always been treasured as a physician would the living body, and with the experience gained and ingenuity in overcoming difficulties I seldom, to-day, extract a tooth.

In the effort to make all plates with suction I had an experience in the loss of a superior left lateral from bad dentistry during my first year of practice, giving me an opportunity to know personally why it could not be used in mastication. I tried in vain. On one occasion, instead of removing it as had been my custom at night, I kept it in, and had finished breakfast the next day before I discovered the fact. There had been accomplished with the plate that which I had never been able to do,—keep it in my mouth while eating. This was suggestive, and I applied it to others, and

[1] This article should have been printed in the Proceedings of 1890, but was not received for publication until January, 1893.—EDITOR INTERNATIONAL DENTAL JOURNAL.

avoided clasping the teeth. In using only suction-plates I allowed many mouths, especially in the lower jaw, to go toothless, and yet, finally, a summersault was turned, and clasps are now used as a *sine qua non.* Adversity came still further to my aid, and it compelled me to use clasps and avoid bridging. The loss of a first inferior molar from too much cutting of bone material to gratify a great contourist, when a flat surface filling was indicated, and the "too much use of the electro-magnetic mallet" to gratify my vanity, destroyed it. I hammered the life out of it, and finally, as no one could relieve me, it was extracted. There was some immediate recompense, for it gave me an opportunity to try my own discovery,—"rapid breathing,"—and this proved an entire success. This loss was a most fortunate one for my patients, as it led me to adopt for them a plan which but for this I should never have thought of.

Up to this time I had persisted in refusing to use a clasp upon any tooth, and hundreds of cases in the lower jaw, and many in the upper, were allowed to go toothless because I could not put in artificial teeth except by mutilation and permanent bridging, which I have never made in a single case.

All practitioners who were consulted in this case said nothing but bridging would answer. Necessity compelled a violation of a supposed law, and the result has been that in ten years I have been doing this class of work, no vacancy in the mouth having gone unchallenged. During all this time I had seen many cases of clasping good teeth, and the reason of decay and wear where the band was placed was apparent.

First. Any one who has any idea of pure mechanics in dentistry must admit that artificial dentures are placed in without any method, reflection, or planning,—certainly not as a mechanical or civil engineer would do in advance on paper,—and with no system to reach the greatest strength of plate and artistic appearance. It is astounding how persons ever get used to sets of teeth where no articulation has been given. True articulation is a sealed book to the majority.

Secondly. Bands are allowed to go too far up and under the gum-border. They are never wide enough. They have either too much spring or not enough for each individual case.

Thirdly. The clasp is allowed to move constantly up and down on the tooth until the tooth is worn very materially.

Fourthly. The clasp is soldered to the plate always in one spot, —on the anterior or distal surfaces of the tooth, just where most spring of clasp is needed.

Fifthly. The clasp has always been soldered on to the plate by fitting both to the plaster cast and soldering them immediately from that.

Sixthly. This plan of soldering never allows the plate to fit as it should, since the clasp draws the plate away from the tooth, and the tooth is forced out of its place and is never easy.

Seventhly. The value of the clasp is lost in not comprehending the exact relation it should bear to the plate.

Eighthly. While the clasp and plate may fit well, it is always a failure if the proper articulation is not in keeping with the opposing teeth. It causes all the strain to come upon the clasped teeth, when the plate should rest easily on the gum, and the clasp be firm yet not binding on the tooth.

Ninthly. The clasp made to fit too closely to every part of the surface of the tooth enveloped results in decay, from the fine capillary surfaces made by the too near contact of clasp and tooth.

Tenthly. From the imperfect soldering of plate and clasps the bands have to be made to closely hug the surface; and, from the narrow necks of most teeth capable of being clasped, the plate is pushed too hard up against the gums, and to make the plate remain in the mouth the clasps are required to be stiffer and are never quite comfortable. There is not only wear, but caries is produced from the driving of the gum away from the cervix.

To add to this experience of clasping, there have been many failures from permanent and removable bridges. To grind off the entire enamel from any sound or partially sound tooth or teeth, to place over it a gold cap for one or many teeth, is the most unjustifiable of vandalisms. When I was told that the second bicuspid and second molar of the inferior jaw must be shaped to place over them caps of gold to insert a first molar tooth, I rebelled at once, as it appeared a sacrilege and a disgrace to our art.

Out of all the cases of bridging that have come to my notice, not one has been perfectly articulated. The surfaces of the bicuspids and molars have been ground flat, and, where cusps were placed on, when the jaw made a lateral movement, there was not a buccal cusp touched. The up-and-down movement alone was of any value. The cusps of gold were unsightly, and not the least art was manifest in the arrangement or in the selection of the teeth. The cement placed between the caps of gold and the tooth never fills up the space, being pushed out or away. Especially is this true of those cases where a part of the face of the natural tooth is shown from the cutting away of the gold cap.

The cement is put in so thin that it is sure to wash, or be dissolved by the powerful capillary force exerted by the oral fluids.

To add to this misery, the cervical border is seldom free from constant irritation. It is only necessary to allude to the stench arising from the accumulations upon the surface of the gold, like barnacles on a ship's bottom.

A bridge can not be kept any cleaner than a plate that is removable, and I never saw one of the latter that did not have to be polished out of the mouth with the same care as polishing silver-ware.

The dentist who will learn to place in partial and full upper or lower sets as they should and can be, and give no trouble to the wearer, will never resort to bridging except in very favorable cases, and not then by ever mutilating a good tooth-crown for a gold cap.

When a few teeth in the mouth are left without crowns, place on artificial crowns that can be clasped to hold the plate or plates in position without any fear of falling out. It is astonishing how firmly one tooth, with a properly-fitting clasp, will hold a full set, upper or lower. I have repeatedly utilized an old root or roots with a porcelain crown, and, in time, should it be lost, the patient has become so accustomed to the plate that it is not missed.

Above all else, I assert, knowingly, that could the art of articulation have been carried out as I have demonstrated so often, bridging would never have come into such general use.

The objection to the system of bridging is that but few of even the best dentists are capable of performing the high class of work necessary to make it successful. It has been used in practice sufficiently long to show that there never was a more signal failure in any line of work, not even copper amalgam.

I have placed on many cases of bridging by the nut and bolt, a process by which the parts could be unscrewed and removed and repaired, and then the nut replaced, and be as tight as a piece of engineering.

When I advocated the cutting of the approximal surfaces of teeth to arrest or anticipate decay, a howl went up all over the land. Now that it is "the thing" to bridge, the same men that abused me for doing what I knew was correct have no conscience in regard to mutilating the enamel of any tooth to which they wish to attach a permanent band. Their gold caps glare in the light, and make vulgarity more pitiable and the dentist more contemptible. Teeth can be clasped, no matter how much they may be out of line or at an angle with the plate, and it will be seen that they will be of far more use and more artistic.

It is not necessary to fill the whole arch and palate with a plate, where a few teeth remain. A narrow, heavy plate, unyielding in character, will stay up just as well when confined alone to the alveolar border. Or where one, two, or three teeth in either jaw must be replaced, they will need but one full clasp and a very small plate to act as a saddle.

When the idea is once grasped of how a clasp should be fitted to a tooth without mutilating it, and how the clasp should be soldered to the plate, then dentists will see a new era dawning upon them.

Be it understood that I am not in opposition to all bridging, but only such as is done by those not familiar with mechanical work. It is then the human teeth have to pay the penalty for ignorance and false ideas of art. There is no occasion to ever deface a tooth, save to sometimes remove sharp angles to allow the clasp to be firm, which does no harm if the surface is polished again.

What can be done to obviate all this?

First, how should a clasp be fitted to the natural crown of a tooth to prevent future caries, and also prevent wear, and of what material and how heavy or light the metal, and how wide and at how many points upon the crown's surface should it touch to insure its steadfastness or security?

The thickness of metal is dependent upon the length of clasp, the width of same, and whether one or more clasps will be used to sustain the plate, or where there has to be very much spring to the clasp in passing over a crown that is very much out of perpendicular.

The metal should be of platinized gold only, without any lining of pure or twenty-two-karat gold soldered on it next to the crown. The metal should be loosely fitted to the crown on the plaster cast and afterwards fitted in the mouth directly upon the tooth and made to touch in at least four places. It should not be struck up to fit accurately every inequality of the surface, nor should pure gold first be fitted to the tooth by burnishing it on and then soldering that to the platinized gold.

If a clasp fits minutely all the surface of the crown, it makes of the minute space between the crown and clasp a capillary surface, and keeps the mucous secretions, as well as the fine food, forever in contact and with no space for circulation of the saliva. Whereas, if the band touches but a few places on the tooth-crown, it will rest just as firmly if it has been well fitted in the mouth and allowed to take its own position when tried upon the crown.

Capillary power made by surfaces very closely approximated is the surest means of producing caries. Where a space is left, the points that do touch are in absolute contact, and, aside from a slight wear on the tooth, the surface cannot decay as when there is an actual and close fitting. If made of fine soft gold, there would always be danger.

A clasp is not needed to grasp the crown very closely. The width of clasp should be as great as can be made, and to steady the plate without grasping it firmly. This will be a new idea to many.

Next to the clasp in importance is to know where it should be soldered to the plate, and on which side of the crown to allow it to go on and off, where the crown is very much out of perpendicular.

In this lies the principle part of the plan, and upon it depends entirely, or greatly, the success of the operation. The plate may fit perfectly, and also the clasp, but all is vain unless the point is known where to unite the band and plate.

This cannot be done unless a plaster impression is taken of both the clasp and the plate in the mouth, so that the exact relation is obtained. The impression of plaster is now run with plaster and sand and the case soldered. To make the whole thing a perfect development the little gold angular tip must be soldered either to the clasp or the plate to keep the clasp from moving up and down.

It should be made of very heavy platinized gold and fitted to the top of the crown around which the clasp goes and upon that part of it that will be free from the antagonism of the opposite teeth. The side of the crown should be selected and marked by observations made in the mouth on the first visit. These can be fitted on the plaster cast.

When the impression in plaster has been taken of both clasps and plate, the easier plan will be to pour plaster and sand into it, and it is then exact, all ready for soldering.

Before any teeth are placed on it, by all means try it in the mouth to see if it will go in and out; for unless the impression has held all the pieces in exact apposition, the plate will not go in or be removed easily. A little filing may be needed to help in the adjusting. Frequently, where the tip rests on the grinding-surface of the crown, the latter has to be ground to let it rest firmly, which keeps the plate from anything more than resting in direct contact with the gum. This must be adjusted very accurately, and the plate will act as a saddle on the gum to prevent riding. This rest prevents any

changes of position of the clasp on the tooth, and also any chafing on its surfaces. It is an absolute necessity. It is better it should be soldered to the plate than upon the clasp, as there will be more steadiness; but it must not interfere with the spring of the clasp. The drawings will show the best place for them on the tooth-crown. They should be very strong, as the whole force of mastication falls upon them. Use eighteen-karat solder for every attachment. These tips can rest on either a gold or amalgam filling, or the body of the tooth. If the latter, the enamel may be cut to prevent the antagonizing tooth from touching the tip.

Where there is decay upon the tooth to be clasped, I prefer to use amalgam containing much gold in it. There need be no fear of galvanic action or shock so long as the clasp is in direct contact with the amalgam.

My long experience with amalgam in these cases assures me that there is no action between these widely dissimilar metals to deteriorate their qualities as preservers of tooth-substance, but the reverse; and the gold amalgam does not discolor to any extent.

I prefer to allow the edge of the filling to stand outside of the clasp and not rest underneath it at the top or next the grinding-surface, and I do not hesitate to use the corundum wheel upon the enamel where slight projections interfere with a clasp resting securely. No harm can result where the cut surface is polished. If caries should occur at any point thereafter from accumulation of food, I should fill with amalgam. But this need not often result when cleansed after each meal.

As I have already stated, the injury done to the tooth where a clasp is upon it is from the food being allowed to remain for weeks in contact,—never from the clasp where it touches, unless too accurately fitted.

Each case must be thoroughly studied after the plaster cast is made, or the result will not be satisfactory. The points on the clasp and plate where the bar is soldered to connect them *are the vital parts*, and, unless judiciously chosen and the bar made of platinized gold wire and the base-plate of two pieces of gold soldered together to stiffen it, and the clasp of proper width and thickness, the strain placed upon the mechanism will break it. The bar holding the clasp and plate must always be upon the side of the tooth where there will be least resistance. Take a second inferior molar that has tipped forward very much and also inclines to the tongue. Here the soldering should be done as far back on the buccal side of the clasp as can be accomplished. Then the spring

of the clasp is not needed for the buccal side, but for the anterior and lingual sides, where projecting from a perpendicular. If soldered from the lingual side, it would be impossible to get the clasp on or off.

In the upper cases it is generally the reverse, although there are many exceptions, and no rigid rules can be laid down. Each one must be specially studied, or no good results. Nor can you rely upon fitting plate and clasp to the plaster-cast and soldering from that,—no, never do it! Take the trouble to take impression of both plate and clasp in the mouth, and then solder from that.

One of the greatest advantages, and one least likely to need repairing, is in the use of English crown-teeth used for rubber, or the tube-tooth for gold plate work. When vulcanized on, or soldered with backing, the grinding-surfaces are of porcelain, and are more artistic and sightly. Besides, if needing repair, it can readily be done. But when care is taken to make the plate heavy, and a stiff bar is used to connect plate and clasp, repairs are seldom needed. I prefer the English tooth, where no soldering is needed to attach it to the plate.

Above all else, the operator is clear from such vandalism as is practised for permanent bridge-work, and has infinitely more pride in the result. Spaces can be filled with satisfaction to patients and for far less money, and the profits be none the less.

A study of the cuts will give an idea of this work, but it will not appear so clear until it is attempted. The articulation for one or two teeth I do directly in the mouth, but for three or more I prefer my articulator, and put on the minute details after the teeth have been attached.

The letters on each cut have reference to the same parts on all. Fig. 1 is a cast for first upper bicuspid, right side. A filling of gold

Fig. 1.

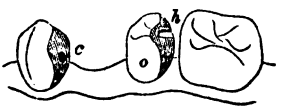
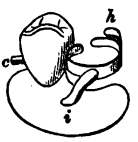


Fig. 2.



was placed in the distal surface of the natural cuspid with a hole, *c*, drilled into it for the pin *c* in Fig. 2. The second bicuspid had also a large amalgam filling, around which the clasp was placed, so that it would not show from the mouth. Fig. 2 gives the plate with English crown thereon, with pin soldered to the plate. The

clasp has a tip at *h* soldered to it, and *i* is the heavy platinized gold bar, showing how it forms the attachment between plate and clasp, and just where; *c* is a pin, soldered directly to the plate, which enters the hole in the gold filling shown in Fig. 1.

Where no filling is in the cuspid I should use a short clasp fitted near the cervix, to reach from the palatal surface to the buccal, where it would not show from the outside, and soldered on the extreme palatal side to gain a spring.

Fig. 3 is the skeleton plate without the crown, which shows clearly the cast for which it was made. (See Fig. 5.) In Fig. 3 is *e*, the tip, resting on the second molar, soldered to the plate. On the plate next to the second bicuspid is soldered an upright with a tip, *e*, and a thin, narrow projection underneath it, which sets in a groove shown at *d* in Fig. 5, in an amalgam filling, to keep the anterior of plate in position and to prevent the plate from pressing too hard upon the gum; *i* is the bar connecting plate and clasp on the lingual side. One or more pins for the crown can be used.

FIG. 3.

FIG. 4.

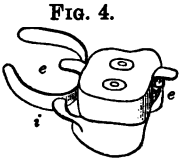


Fig. 4 shows the same with the crown cemented on with oxy-phosphate, or vulcanized, or with gutta-percha.

Fig. 5 is a case, left side, lower jaw.

FIG. 6.

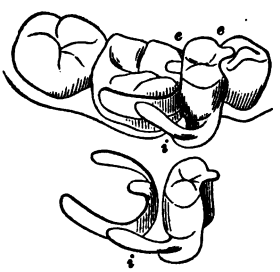


FIG. 5.

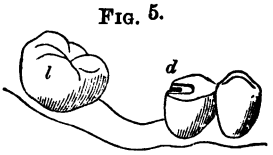


Fig. 6 is a second bicuspid tooth, right side, lower jaw. The bar *i* is soldered to the plate and clasp on the buccal side and the tip on the clasp on the first molar, and, as the crown is made entirely of gold, the tip is soldered directly to it to rest on the first bicuspid,

and the anterior surface of the gold crown is made concave to fit into the distal surface of the first bicuspid, which prevents any movement laterally. A gold crown is used, as it is not seen, and facilitates greatly the soldering and adds immensely to the strength, and there is no danger of repairing in the future. The back tip, which rests on the molar, should have been soldered to the crown also, and less strain would come on the clasp.

Fig. 7 is an extreme case of tipping of the third molar, lower jaw, right side. The clasp was soldered to the plate on the buccal surface, and the plate at the second bicuspid was held as in Fig. 4. It could have been done by a narrow clasp to reach only partially around the second bicuspid, where it would not show on buccal side.

FIG. 7.

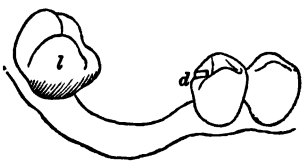


FIG. 8.

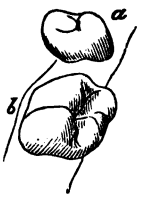


Fig. 8 is another extreme case where the second molar in the lower jaw projects towards the tongue and the second bicuspid towards the cheek. In this case the bar should be soldered on the buccal of the molar near its distal proximal surface at *b*, and the second bicuspid on the lingual surface at *a*.

I cannot urge too strongly the retention of all roots that can be made healthy when no crowns can possibly be placed on them. When allowed to remain, and these plates fitted directly upon them, they become firm and non-irritant, and enable the same pressure to be used on the artificial teeth as on the natural ones, and are clean as any part of the mouth. I seldom remove a root that can be reclaimed. The satisfaction to the patient is immense. The retention of one tooth, either with natural crown or artificial, is enough to hold in position a full upper set with a plate very narrow and confined alone to the alveolar border, and with no suction, provided the articulation is perfect.

I can further assure the far more perfect success of these operations if the clasps are made to touch not more than at three or four points on the crown. Where fitted accurately, caries is doubly invited by capillary action.

Not least of all the virtues of this class of operations is that

the average dentist in plate-work, or even the operator, can learn to successfully do it, when but few can pretend to do a respectable piece of bridging.

While it is so easily done if nice care be used, I do not wish to be understood that I would have any tooth extracted, knowing that it could be replaced so handily and to such perfect satisfaction to the patient.

I wish it further understood that the patients for whom I did these operations were not mine originally. I am thankful that from the very first of my career I have held the human tooth so sacred, and as years advance I am jealous of every root that can be at all utilized; and I believe I am clean in such matters, and keep my patients so, or I could not have laid claim to have extracted so few teeth from any cause. Whatever there may be about this method that is original, I freely tender it to the profession as not only worthy their serious attention, but free from any incumbrance.

THE regular meeting was held December 10, 1892, at the rooms of the Society, 1228 Walnut Street, Philadelphia, Dr. Louis Jack presiding. After the transaction of the usual routine business, Dr. Bonwill rose to a question of privilege, and this being granted, said,—

"Professor Truman, in the discussion on my essay, 'Mechanics in Dentistry,' etc., remarked, 'It is no wonder Dr. Bonwill did not value his degree; he never earned it. If he had gone through the schools, day after day sitting on the hard benches, and had studied along with others, he would have appreciated the feeling all have as students and as co-laborers. He came into the profession through another door, and there I leave him.'

"First, not a word that I said was against the college that gave me my diploma nor any of its professors. I meant that I thought nothing of my sheepskin only so far as hanging it in my office. I laid it away for reference, and only brought it forth when the officers demanded it for registration. The Pennsylvania College of Dental Surgery offered a degree of D.D.S. to all practitioners of fifteen years standing if they would take out tickets for one course, undergo examination, and pay for diploma.

"After having studied medicine in Jefferson Medical College, 1864, Professor Buckingham offered to give me what was considered an honorary degree by simply paying for diploma and submitting to examination. I appreciate the diploma as I do the many medals I have.

"Now, all I ask of my old friend, Professor Truman, is to do what I know he will, that the world may know I did not 'get into the profession through another door,' as he has insinuated. If I am not worthy, then he should bear the blame.

"I beg pardon for bringing such a delicate subject before the Society, but, it being on the record, and as Professor Truman wrote me he would have cut it out had he known I did not hear him, I deem it best to reply. If he cannot do me justice, then I am unable to find one who will and can.

"I leave the matter now to Professor Truman and this deliberative body."

Dr. Truman.—In reply to Dr. Bonwill, I have only this to say, that my remarks upon the occasion referred to had allusion entirely to the feeling accompanying the reception of a diploma conferred after laboring assiduously for it, and that which follows the one conferred honorarily. It was in this sense that I used the expres-

sion, "It is no wonder Dr. Bonwill did not value his degree; he never earned it." The balance of the paragraph makes the meaning clear, and I am surprised that any other construction should be put upon it. As Dr. Bonwill regards it differently, I wish to repudiate here distinctly any idea at the time of alluding to his work in the profession. If I were in favor of conferring honorary degrees for professional services, I would have great difficulty in finding one more worthy or better qualified to receive it than my friend, Dr. Bonwill. These need no laudatory notice at my hands, nor could any one by a word lessen the great value of the results of his laborious life. I certainly would not be that one. Hence I am glad to be able to make an explanation, and trust it will be accepted in the spirit in which it is given.

The subject was then passed.

Dr. Edward C. Kirk read a short paper on "Crystal Mat Gold," followed by a discussion of the topic presented.

CRYSTAL MAT GOLD.

BY EDWARD C. KIRK, D.D.S.

At the last meeting I presented the result of an experiment in the use of crystal mat gold, for the reason that since I commenced the practice of dentistry I have experimented from time to time with various forms of sponge gold and have never attained results which were satisfactory until recently. I have taken it up and abandoned it again and again. I have given it limited use, but for such operations as I exhibited at the last meeting I have found it uniformly good. I brought the patient here, and exhibited the fillings, because, to me, they seemed satisfactory; and I asked at that time to have a committee appointed, so that I might have the benefit of their judgment whether they would be accepted as good operations in gold,—regardless of the kind of gold, but simply as gold fillings.

I now wish to state what I have to say in regard to the method which I employed in those operations.

The principal difficulties which I have heretofore experienced in the use of any of the well-known forms of sponge or crystal gold have been the inability to secure satisfactory margins, and the tendency which the material has of balling up, and so bridging unfilled spaces in the cavity, and at the same time producing an unevenness of surface to the gold plug which it is difficult to

counteract. Heretofore the amount of delicate manipulation and careful work necessary to insert a filling of sponge gold which would compare favorably with fillings of foil has been so great that the amount of time consumed in making such a filling constituted the greatest obstacle in its employment. There seems to be no doubt that a filling can be made of sponge gold which answers all the requirements of a perfect filling as satisfactorily as one made of foil, but for the reasons noted, and under former conditions, it seemed to bear no comparison to gold-foil in ease of manipulation and the consequent amount of time necessary for its insertion. Some experiments recently undertaken, with the view of determining the adaptability and comparative working-qualities of the form of sponge gold known as crystal mat, have brought out certain new data with regard to the working-qualities of this kind of gold which lead me to believe that when its manipulation is properly understood and definitely carried out in harmony with certain principles, its introduction can be accomplished with a degree of certainty, ease, and rapidity equalling, if not surpassing, that of foil and its various preparations.

First, with regard to the marginal preparation of cavities. In order to insure the best results with crystal mat the margins of cavities must be strong, and formed with a bevel. They must present a square shoulder, so that when the gold is finally finished it will be butted up against the margin without any overlap. Where a bevel is used I have found it next to impossible to prevent the wedge-shaped edge of gold which forms the slight overhang at the bevelled margin from breaking in finishing, but if the margins are made square-shouldered, as stated, this does not occur, and the joint can be made absolutely perfect with ordinary care. The use of sponge gold in starting fillings by filling undercuts or retaining-points is well known, and its use for this purpose has gained wide acceptance by the best operators. It is therefore not necessary to comment upon the value of this kind of material for that purpose. In the filling of the body of the cavity, after the anchorages are disposed of, I have found the best results to follow the method which I shall now describe. A pellet of crystal mat gold approximating the size and shape of the floor of the cavity should be selected, and, after annealing, carefully placed in position, so that it well covers the floor and is in contact with the anchorages, care being taken to introduce it with as little compression as possible. A plugger point with shallow serrations is then used to tack it to the anchorages, after which a broad-faced foot-plugger, serrated in but one direction

preferably, is used to compress the pellet into place by hand-pressure. When it has been firmly condensed by hand-pressure it should be malleted into a uniformly homogeneous mass.

A number of operators have expressed the opinion that crystal gold should not be densely malleted, claiming that better results are obtained by the use of a light mallet-blow, or by hand-pressure. My experience leads me to take exception to this. I know of no form of gold that will endure the amount of malleting which crystal mat will. It becomes denser and more homogeneous by hard malleting than any form of gold with which I am acquainted. This seems to be born out by a study of the physical make-up of crystal mat gold as compared with foil. In the use of foil the amount of force necessary to bring about perfect cohesion of superimposed laminæ is inconsiderable. This is shown by the ease with which solid plugs can be made of foil by hand-pressure or by the rotation method; but with crystal mat, or any form of sponge gold, continuous and evenly-applied malleting is necessary to bring into perfect cohesion the minute particles of gold which constitute its make-up. The malleting must proceed in every direction, in order that the plug shall be of uniform density and of perfect cohesion throughout, a result which cannot be accomplished by ordinary hand-pressure. The principle which should govern in the condensation of crystal mat gold is to first bring about a moderate cohesion of its particles by means of hand-pressure, whereby it is made more strongly coherent, and is thus prepared for the further condensing action of the mallet. If the mallet were applied from the first to the soft, loosely-held-together piece of sponge gold, the effect would be to disintegrate it, or break it up into particles; but if partial condensation is first secured by hand-pressure, the cohesion of the mass is sufficiently great to withstand any amount of malleting, which only serves to further condense and solidify it.

Before dismissing the question of margins I wish to allude to a device which I have used to secure perfect marginal finish where the cavity edges have been prepared otherwise than square, as before advocated. When the cavity is filled flush with its margins with crystal mat, thoroughly condensed, the margins can be made perfect by malleting on several thicknesses (three or four) of No. 20 rolled gold to perfect the margin, and then continuing with crystal mat until contour is fully restored. The points with which I have secured the best results are the finer numbers, extremely small, with shallow serrations. My habit with foil fillings is to use a rather broad surface-plugger, but I have found better results in

using crystal mat with the fine points, as noted. The cohesive quality of crystal mat is quite remarkable. In several instances where I have found imperfections of margins on the labial aspect of approximal incisor fillings, a defect, for instance, which had developed under the use of the plug-finishing burr, I have been able to add to the surface a sufficient quantity of crystal mat gold to restore the imperfection without making any grooves or retaining-points in the gold. In other words, the surface of a plug made with crystal mat gold which has been cut by a plug-finishing burr is sufficiently cohesive to retain additions of cohesive gold to its surface and form a solid filling without undercutting or grooving the plug for the purpose of gaining a retaining hold. The point at which condensation has been perfectly performed is well indicated in the color of the surface, which changes under the mallet as the condensation progresses. By constant malleting the brown tint of the crystal mat gold disappears, and its color becomes lighter and lighter, until it is in no way distinguishable from that of a foil filling. If, during the process of malleting, the surface of the gold plug be examined from time to time with the glass, it will be seen to present areas which are perfectly bright and metallic-looking, and of the normal gold-color, and between these, slightly darker and brownish particles, which represent the non-condensed particles of crystal gold. The malleting should be continued until all of these brownish specks or particles disappear and the surface of the plug presents a uniformly golden-yellow appearance and solid metallic texture. An extremely valuable use which I have made of crystal mat gold is in connection with an oxyphosphate of zinc lining in cavities of extensive decay, where the walls are so weakened or imperfect that further cutting, for the purpose of securing anchorage, becomes undesirable, as producing an element of weakness in the operation. In these cases I have adopted a plan which is a modification of a method suggested by Dr. Oltramare, in a paper before the last Swiss Congress, as follows: The cavity is prepared with as much anchorage in the tooth-structure as is obtainable, consistent with strength, and then lined with a small amount of oxyphosphate of zinc in a rather soft, sticky condition. A pellet of crystal mat gold, approximating the form of the floor of the cavity, is embedded for about half its depth in the cement, and time given for the cement to thoroughly harden. All excess of cement is then removed with an excavator, and the crystal mat gold is afterwards condensed and malleted strongly to place. This furnishes a cohesive foundation, upon which the balance of the

filling may be applied, in connection with such retaining anchorages as it has been otherwise possible to secure.

A large number of fillings inserted in this manner during the past year have been extremely satisfactory, and show no evidence thus far of any tendency to leak or become loose. The rapidity with which a filling may be made with crystal mat gold is somewhat remarkable. I have made no accurate time observations in comparison with foil, so that I cannot give exact data in regard to it; but I am quite sure that the time consumed in the filling of a cavity, by the method described, with crystal mat gold is from a third to a half less than would be required to do the same operation with foil. Its great value, so far as rapidity is concerned, is demonstrated where extensive contours are to be made. It is not my intention to advocate a wholesale use of this material, to the exclusion of other forms of gold. My object in calling attention to it in the manner here described is to emphasize what I believe to be a fact,—that perfect fillings can be made with this material, in certain classes of cavities, with more ease and rapidity, and with as good, if not better, results than with foil. The objections which have been raised to the extensive use of the ordinary sponge, or crystal forms of gold, are no doubt just, and have had their foundation in several causes, which, in the form of sponge gold under consideration, are, I believe, obviated. In the first place, the preparation is absolutely pure gold. At the time sponge, or crystal, gold was first introduced to the notice of the profession, or soon after, a number of processes for making this material were published, and the consequence was that many dentists made it for themselves, or its manufacture was lodged in unskilled hands, with the result that the product was more or less contaminated with substances which acted injuriously upon the tooth, or in some way affected the integrity of the filling. More than this, the crystal form of the product was not uniform, and was so variable in the shape and size of its ultimate particles that no two samples acted or worked in exactly the same way; hence, great variety in results was the natural consequence. Again, it was put upon the market in large blocks, and it was left to the operator to cut or tear apart, getting pieces of irregular size and form, which introduced a feature of inconvenience in working-quality, resulting in irregular condensation of the mass, unevenness of the filling, pitting, etc. Such gold was known to ball up, or bridge over, and produce a plug which lacked homogeneity. Crystal mat, besides being an absolutely pure product and free from the chemical impurities which characterized

the earlier preparations of sponge gold, is furnished by the manufacturer in pellets of assorted sizes, so that the operator has ready at hand a range of sizes from which to select the pellets for filling a given cavity, and with these at hand, and a uniform mallet-power, the work proceeds evenly throughout, resulting in a perfectly homogeneous plug. In conclusion, the best results with this material, I believe, are obtainable only with the Bonwill mechanical mallet, with a spring-roller cam. The character of the blow delivered by this instrument, properly adjusted, produces a result which I firmly believe is not otherwise obtainable.

DISCUSSION.

Dr. Darby.—I have had a great deal of experience in years past with Watt's crystal gold. When it was introduced I was one of the first to try it, but my experience has not been as favorable as that of Dr. Kirk. I have found difficulty in working it, except in large, open cavities, where I could insert it with a broad-faced instrument. In cases of that kind I have found it very satisfactory; but the use I have put it to more commonly than others is, after bringing my filling near the surface, to use this gold for finishing. There it has worked very nicely. I have never been in love with Watt's crystal gold, and when asked why I use it I am sometimes at a loss for an answer. I think one reason is, that Watt's crystal gold, being a preparation of crystals, is liable to deteriorate more rapidly when exposed to the air. It presents a greater surface, and the crystals absorb moisture. I think it deteriorates more rapidly than any other preparation of gold.

Dr. Woodward.—I have used it, but to a very limited extent. My experience with it is something like Dr. Kirk's. If the gold is first carried to place, and partially condensed, and then malleted with any good mallet, it becomes very dense, is very cohesive, and sets where you place it. As long as the cavity is a large one I get along very rapidly, but when it is small it does not work as satisfactorily. The ordinary cohesive gold under a mallet makes fillings that would be like wrought iron compared with crystal gold. If I wanted great strength in fillings I should use the ordinary forms of cohesive gold; but crystal mat is of great use for various forms and places; in filling undercuts, for instance, or in a molar in which there is a large cavity, with strong enamel, and it is undesirable to cut the enamel wall away. This can be filled entirely with crystal mat, and can be burnished with a small ball-burnisher. In starting cervical edges it is very satisfactory, and especially with

a matrix, as it can be crowded in several layers, with a broad plugger, into place. There are uses for it, but I think we will have to get acquainted with it before we can tell what they will be.

Dr. Kirk here stated that it was only in the class of cases that Dr. Darby and Dr. Woodward had called attention to that he advocated its use.

Dr. Truman.—I have had a little experience with it, and, from my observation, it works exactly like all the crystal gold I have ever used. I like it very well for a certain class of cavities; but the question comes up always, when crystal gold is discussed, What is it, and what does it do? Crystal gold, whenever it reaches the wall, or border, can never, in my opinion, be packed exactly solid. That matter was settled twenty years ago. The Pennsylvania Association of Dental Surgeons, of Philadelphia, made extensive examinations of crystal and sponge gold. I then spent a great deal of time in microscopical examination, and came to the conclusion that it could not be properly packed against the wall, for the simple reason that the crystals slide one upon the other, and it seems impossible to secure perfect cohesion there. The result of its use was a constant complaint of leakage, that being ascribed to various reasons, but it was always considered as the action of the uncondensed crystals.

I have spent a great deal of time in former years in studying gold crystals, and the working of gold preparations, rolled gold, rolled tin, and other materials, and this labor satisfied me that we know very little about the action of crystals. Dr. Woodward has stated that when a mallet is used upon mat gold it condenses very well. This is true; but I prefer, in using it, to employ hand-pressure with a broad instrument. I think we can do quite as well without the mallet.

I have examined this mat gold microscopically, and have failed to discover wherein it differs from other sponge gold. The material is exactly the same as Watt's crystal gold, as far as I have been able to observe. I think it will be found of value, but that it will always be difficult to make it perfect along the edges of cavities.

Dr. McQuillen.—I have been rather more fortunate in the use of crystal gold than Dr. Truman. Six or seven years ago Dr. Darby told me of fillings he had put in twenty years before, and I think that after seeing those fillings I used more crystal gold. I commenced its use at that time, and have been using it ever since. I do not think any of us would depend entirely upon this form of gold. I have been delighted with the margins, and I seldom see or hear of a filling of crystal gold leaking that I have put in. They

have been very satisfactory, and since seeing those operations of Dr. Kirk's, at the last meeting, I have been using mat gold in the cases he describes,—large operations. I have been very much pleased with the result.

Dr. Bonwill.—Gold is a very interesting subject, yet I don't use as much of it as formerly.

It is a question whether we have any necessity for a new gold; whether that which we have is not all that is required for the use of any one in inserting a gold filling. I have used one kind, and still adhere to Abbey's. There are some objections I shall urge against the use of mat gold. The essayist says he is obliged to use hand-pressure as well as the mallet,—hand-pressure first, and the mallet afterwards,—until it is a perfect homogeneous mass. He can pound a great deal longer than he can with foil. He states that it will not do to overlap the wall of the tooth with it. It cannot be bevelled as gold-foil, as the edges will break. I don't know of a greater demand at present than for the perfection of gold-fillings by bevelling the cavities and carrying them over the edge,—over the wall of the cavity to prevent the wall from breaking. If I am to be restricted in the use of that gold in this direction, I would not use it.

The doctor then explained what he meant by bevelling.

Dr. Peirce.—The fillings placed in by Dr. Kirk were faithfully done and conditions observed that made it very practical. It is very admirable work. I think, as was said by several gentlemen, that sponge gold has a place in the office, and it can be used to very great advantage in many cases. And I also wish to emphasize what he said, that we cannot build out thin edges because it has not the tenacity of foil. If I have a large cavity,—a molar, for instance,—with a good wall, I can fill the cavity with mat gold in half the time I can with foil, and make an operation as serviceable as it is possible to make it. In that way it does us good service because it economizes time, but if we undertake to build out thin edges we are certain to make a failure of the operation.

Dr. Guilford.—I think mat gold differs from the other kinds of gold we have had in the finish of its crystals. How it is produced I do not know, but I believe it is by a method of deposit. In depositing copper, preparatory to making copper amalgam, we can have coarse or fine crystals, according to the quickness or slowness with which it is deposited on the electrode. I suppose they have a means of preparing it slowly and in finer crystalline form.

Sponge gold, in various forms, has been presented a number of times in the last twenty years. I remember very well a circum-

stance occurring several years ago. Dr. Magill was quite an advocate of the use of crystal gold. He used it extensively in his practice, and he called a number of us to see several mouths he had treated with fillings of this kind, and they were very beautifully done. A few years after, he wrote that he had abandoned it. He found that, after all, he had been more or less deceived by it, and returned to the kind of gold he had formerly used. I think, as others have remarked, that crystal gold has its place. There is no doubt we can do good work with it, and it is as good as any other kind of foil, under certain circumstances and conditions, but when we violate those conditions we have failure. I think if we have proper access to the cavity the filling can be made of crystal gold just as well as any other kind, if there has been sufficient experience in its use.

There is another objection to it, and I think it is a very serious one. It is recommended especially as a finish for fillings and for use at the cervical margins of the cavity. That is just the place I should object to employing it. It is very easily torn, broken, and powdered. Upon surface fillings we can get along with it, but at the margin it becomes brittle. I should never think of using it there, and have always found it unsatisfactory.

I have tested mat gold quite extensively in the last few months. I used it recently quite satisfactorily in a molar tooth that had a very large compound cavity, and next to it was a tooth filled with amalgam. I filled the posterior part with amalgam and upon that laid crystal mat gold. In that kind of filling I have found great difficulty in making it unite with the amalgam placed in the cavity, but with mat gold this was readily accomplished. In connection with phosphate of zinc I think it is very excellent.

It has its uses, yet at the same time I think it is a gold we dare not take liberties with, and must be careful in its manipulation.

Discussion closed.

The question for the evening was then taken up for discussion,—"Should immediate root-fillings be practised while purulent conditions exist at the apex?" Opened by Dr. Peirce.

Dr. C. N. Peirce.—This question, as stated, implies that there is some expeditious and comparatively certain method of either removing, or else rendering innoxious the previously existing or recently acquired purulent condition at the end of the root, other than by the usual one, of either antiseptics, disenfectants, escharotics, astringents, alteratives, counter-irritants, desiccation, etc., and that without the use of these remedies, and in disregard of the

septic conditions, the root-canal and crown-cavity can, immediately on the discovery of this previously estimated unfavorable pathological condition, be filled, and that sole reliance for subsequent comfort and success can be had through either systemic conditions or local recuperative power; the inference being that this accumulated pus and septic condition which is recognized, is immediately, on the tooth being filled, to be either transformed into nutrient pabulum, building-material, etc., or else taken up by the absorbents and carried off as a waste product. I must confess that I have not confidence in unaided natural processes accomplishing these results, yet the inquiry upon which this discussion is based may be answered in both the affirmative and the negative, the correctness of the answer depending entirely upon the condition of the surrounding structures which are present at the time the thus affected root is to be filled; for instance, an established fistula penetrating the process and overlying gum, through which the product of decomposition can find a ready means of exit; and after the canal has been placed in an antiseptic condition filling is not only pardonable, but under some circumstances desirable practice.

Through the fistula the apex of such a root could be reached and the purulent condition as readily overcome or corrected as by the application of remedies through the canal, while by the immediate filling after these prescribed conditions were secured the function of the tooth would be regained and the tissue at the apex protected from the danger of increased irritation by the ingress of foreign substances through the canal. On the other hand, if the conditions at the apex of the root are such as are frequently recognized, and the accumulated product kept at its minimum rate by an open canal, then to close this means of relief and discharge without first checking its accumulation would, in my judgment and experience, result in an inflammatory condition which would be anything but agreeable to the patient, suffering continuously, until relief was gained by either an artificial opening or through the pressure of accumulated pus, or absorption gave relief with a natural fistula. One or the other of these methods must be adopted to terminate the inflammation which will, with few exceptions, follow the abrupt closing of the only means of exit. These exceptions would of course be only in such cases as where the absorbents were sufficiently active as to overcome the accumulation of the purulent product; in that case it would be carried off with other waste material and the surrounding parts be thus freed or relieved from the septic influence.

There is another type where purulent conditions exist at the apex, and where, with a limited degree of safety, immediate root-filling may be practised. This is in teeth where the pulps had died without exposure. The cause of devitalization not being pertinent to the question, I shall not dwell upon it. Decomposition of pulp has followed, with only a very limited degree of irritation in the pericemental membrane at the apex of the root, but yet sufficient to establish a thickening of this root-covering, with some exudation, but both have been controlled by favorable systemic and local conditions, with activity of absorbents. The canal on being opened into is found filled with a yellowish fluid, but the parts around the apex have for months, probably, tolerated this condition, and would for months, and it may be years, longer. The opening into the crown and root has been made not to relieve suffering, but to prevent further discoloration of the crown. In this case, or in most of these cases, it is quite possible to cleanse the root, dry it as completely as possible, securing an absolute antiseptic condition so far as atmospheric germs are concerned, and fill at once with little or no danger of subsequent unfavorable conditions; and yet such treatment is not desirable practice.

Now, in these several conditions which have been indicated where undoubtedly a purulent product exists, the remote but at one time quite general practice was to fill immediately, and then with a drill make an opening into the root-canal or pulp-chamber from just beneath the gum margin. This treatment has saved thousands of patients from discomfort while they yet had purulent conditions existing at the apex of root, but is it good practice except in some rare cases?

Dr. Register.—Since I have been using large quantities of hot and compressed air in connection with atomization my results in practice have been so different that I feel great good has been done,—certainly to my patients.

In regard to the question, I do not know whether it refers to indolent abscess or whether to putrescence in the pulp-chamber. If it is to putrescence from devitalized pulp, and there was no fistulous opening, I should make use first of a germicide, and then arrange the dam in place and use the hot air in large quantities, so that desiccation is thorough, then fill it while it is in that sponge-like condition. I think that immediate root-filling is indicated; certainly, from clinical experience. It has been my experience that it is good practice. It has been my impression that this carbonaceous matter that exists in a devitalized condition is the cause

of the subsequent trouble with teeth of that character. Some have the idea that if the apex of the root be closed the trouble is avoided, but I think that is an error.

Dr. Thomas.—It may seem presumptuous for me to say anything in regard to root-filling where there has been a discharge either from the canal of the tooth or from a fistula. It has become a question in practice,—How long is a dentist justified in treating that root to stop the discharge? Experience has accumulated in capping exposed nerves. It was advocated that the nerve could be capped and the tooth made perfectly useful, yet it was a common thing for patients to come to me suffering from this treatment. In a case of pericementitis the patient may not come back, and possibly septic matter may have infiltrated along the tissues and formed a fistula. The tooth is treated, but there is an increase of inflammatory symptoms, infiltration, and another abscess. It may be treated again, but only after the formation of a fistula does the patient get relief; consequently there is no reason to visit a dentist, and probably there is no attempt to see one, and after a while it has gone so far that the process between it and the cuspid tooth has necrosed and the tooth must be removed. Is it good practice, or how long is it justifiable in a dentist to continue with such a tooth? and I would like, individually, to know whether you can make a tooth of that kind perfectly healthy and do away with the discharge; or how long would it remain so, or how much security can you give the patient that it will be a perfectly and permanently cured tooth? It grieves me to have a patient come for extraction with a filled tooth treated for abscess with a large fistula supposed to be cured. What can I do, and can I make it a perfectly well tooth? How long are you justified in treating it for that purpose?

Dr. Truman.—It does not appear to me that there is anything in this question. It is, Should you fill a tooth while it is in a purulent condition? No; of course you would not. That is the only answer I would give to that question. But in the broader sense, as I presume it is meant, will you do anything to a tooth which has pus in the canal? Dr. Peirce has taken up that point and handled it very well; but Dr. Thomas has brought up another, —Can we fill any tooth that has once had pus at the end of the root? I think you will agree with me, that pulpitis necessarily affects the pericementum. I do not think it is possible to have septic conditions in the pulp and not affect this membrane and increase further the development of pus; and wherever there is pus there must be destruction of tissue and a necrotic condition.

I have long entertained the idea that it was absolutely impossible to produce a healthy condition where pus has existed for a lengthened period at the end of the root. Immediate filling of such a tooth is, to my mind, impossible. We must change the conditions. If the root be necrosed, the dead tissue must be removed. If necrosis has not commenced, and the pulp is simply decomposed, it must be treated. Dr. Register says he accomplishes this by dry heat. I question this conclusion, as the heat required to destroy micro-organisms would destroy the tooth-tissues.

The whole territory of the dentine is filled with organic matter. It is in a decomposed state, and becomes a factor for future trouble. What is to be done with it? Years ago I recommended that it be coagulated, and that for this purpose chloride of zinc be used. It was said in answer that coagulation never would extend beyond the open mouths of the tubes. It has been demonstrated that it can be carried into the tooth. We can only approximate health in the treatment of many cases. When the destruction of the pericementum has been reached, we have arrived at a surgical operation,—cutting off the end of the root. Until that is done there will never be a healthy tooth in the mouth.

Dr. Register.—I rather hesitate to talk in reference to anything performed in my own practice. I offer the statement that I rarely at the present day have a fistula to treat. Only yesterday a lady came in to see me. She had a very bad molar and was in a very delicate condition. The central incisor had been treated for a number of years in the usual method. I operated on the tooth but once. It had a fistula and a gumboil at the end of it. I first washed it out with an atomizer, and after that by dilute sulphuric acid. I used this in about an eight-per-cent. solution, as a solvent to dissolve the carbonaceous matter that filled the tubulated structure of the dentine. I then followed this with Labaraque's solution. If it has a fistula it is given a treatment with acid of four-per-cent. solution.

I avoid using air intensely hot. The idea is to obtain thorough desiccation, and while in that condition to use some agent that will follow it up as a germicide. I have had a great deal of success with a preparation of from fifteen grains to an ounce of iodoform to an ounce of sulphuric ether. The odor is destroyed with oil of cinnamon. While the tooth is in this dry condition I saturate it with this liquid, and can immediately fill the canal with any preparation I prefer, either gold, or cotton saturated with phosphate of zinc or chloride of zinc.

Dr. Guilford.—I would like to know whether there is any one here who would have his teeth filled while there is a discharge of pus from the roots? It seems to me we would not be justified in doing for a patient what we would not want to have done to ourselves. It is evident, as far as the discussion has gone, that we have lost sight of the fact that there is such a thing as pyæmia. You remember how it carried off one of the Presidents of the United States. It is a serious matter, and I am surprised that it should be presented in this form. No one should think of filling while there are purulent conditions existing around the root.

Dr. Register stated that he did not mean to assert that he would fill a tooth having an indolent abscess. He desired it understood that he referred to a putrescent condition of the tooth-canal where there was no indication of a chronic abscess existing.

Discussion closed.

Incidents of practice were then taken up, and opened by Dr. Peirce, who said,—

I have a little matter here of some interest. There have been some questions in the journals in regard to the influence of abnormal conditions of the teeth in neuralgia and other disturbances. Some months ago a lady who had been present at one of my lectures on the influence of the teeth on facial neuralgia came to see me. She had worn an artificial denture for eight years. Upon examination of the mouth, I found on the left side a large tumor, for the accommodation of which the plate had been cut away. On passing a lance into the mass, an enamel surface was at once detected. On a free incision, opening it for the introduction of a pair of forceps beaks, an ordinary three-cusped, compressed-rooted third molar was readily removed. On further examination other teeth were recognized, which, upon removal with the forceps, proved to be three additional, supernumerary in character, united with apparently a membrane of connective tissue. On placing the four teeth together in the same relative position they had occupied in the cyst, the upper and larger one, the representative of the normal third molar, had been embedded with its crown towards the cheek. The next in size was closely adapted to a depression in the larger one, and at a slight angle to its vertical axis. The third in size was, in similar manner, fitted into a depression of the second in size, and in the same line deviating from its vertical axis; while the fourth in size, not much over a sixteenth of an inch in length, or rather between a sixteenth and an eighth, fitted into a well-marked cavity in the third or preceding in size and description.

The crowns of these teeth all possessed multiple cusps; the largest one had, as above stated, the three cusps of an ordinary third molar, while the second in size had quite a pronounced central cusp encroaching upon a proximal surface, with three cusps on the other proximal side and one on each side of the more central cusp. The third tooth in size had four rounded cusps, with a deep sulci in the centre of the crown. The fourth and smallest of the group resembled more an inferior bicuspid, with the cusp on one side much more prominent than that on the other, both cusps, however, being divided by slight sulci. The point of most interest to the patient was that in the removal of these abnormal growths the suffering, which had been severe and of long duration, was entirely relieved.

Dr. Darby.—I saw an interesting case a few days ago. A lady came to me with a tumor inside the cheek as large as a thimble. In a very solemn way she said she wanted to consult me about something in her cheek, stating that her father had died with cancer, and, while she was not frightened, she thought this was of the same character. I examined it and found a top-shaped tumor protruding into her mouth just opposite the molar tooth of the anterior jaw. I asked her if she was not in the habit of drawing her cheek in by suction, and she replied she thought she was. I found she had lost the second molar, and the wisdom-tooth was in position, and that the suction had produced the tumor. I told her I did not think it was a cancer, and procuring a piece of floss-silk, I made a loop and passed it around it to shut off circulation, and told her to report to me if anything strange happened. Within the next few days I received a letter from her saying the cancer had dropped off into her mouth, and she was convinced it was not malignant.

The subject for discussion, "What are the best compositions for temporary fillings for a minimum period of three years?" was then considered. It was opened by

Dr. Peirce.—In considering the advisability of materials for temporary fillings, we must take into consideration the location of the cavity to be filled, and also the condition of the tooth. Those two things would modify my practice very much as to the selection of material. We have, of course, several preparations used for that purpose, and used very advisedly in certain teeth. If I had a cavity in the central incisor of a child, for instance, or where the patient was not able to stand a gold filling, or where there was not sufficient room to put in a gold filling, as on the mesial or distal surfaces, I should prefer to place in a filling of gutta-percha or

phosphate-zinc or chloride-zinc cement, believing it would be very comfortable and thoroughly protect the tooth from decay as well as any other material, being attended with less tax upon the patient or the endurance of the child. On the other hand, if the cavity was on the masticating surface of the first molar, and I desired to insert a temporary filling, then I should prefer a zinc-phosphate filling, believing it would give more durability and would as well also protect the tooth from further progress of caries. Where the cavity is on the mesial or distal surface, whether anterior or posterior, where I desire a filling for temporary use, lasting as a minimum three years, I am in favor of using gutta-percha. With deciduous teeth I prefer the pink, because it has some advantages over the ordinary white gutta-percha. The pink gutta-percha in a child's deciduous tooth adapts itself at a low temperature to the cavity, and also has a degree of resistance that the white does not, because of its greater elasticity or the less amount of mineral substance in the material. I think these three materials—pink and white gutta-perch and zinc-phosphate—are the best. The practice must be varied according to the location of the cavities, and also by the age and endurance of the patient. I have had very good results with pink gutta-percha where I could do little more than wipe out the cavity and warm a pellet and press it in. With an irritable patient and disinclined to have anything done with the cavity, and where it is impossible to keep it dry, take out the softened part and pack in pink gutta-percha. In my hands it has produced very good results, protecting the teeth from further decay for a period certainly of three or four years.

In permanent teeth, where color is of some importance, I should use the white, but that requires more softening and does not have for the masticating surface so resisting a capacity as the pink. I meet with a great many fillings, placed in by myself and others, of zinc-phosphate, but they vary so much in different mouths that they are not reliable. I see fillings very often that have been in for three, four, or five years, and they keep their integrity well, but in other cases they have dissolved and grown imperfect at the cervical margins quite early after being put in; so that I do not consider phosphate of zinc so reliable in cavities bordering on the cervical margins as I do pink or white gutta-percha. But one of these three materials is used invariably where I want a temporary filling lasting from one to three years.

Dr. Jefferies.—I have pursued the plan Dr. Peirce has stated, and I find it impossible to fix upon one material. Different cases

require different treatment to attain the best results, and the course he has pursued has been the same as mine, except in some where the decay is large between the teeth and it is necessary to use zinc-phosphate to make it last the longest period,—for a minimum of three years. I combine it with gutta-percha at the cervical margins, which has been the practice of a great many. In that way, as that seems to be where it is first dissolved, we get the best results. In other respects my practice is exactly the same. I use gutta-percha for front teeth and cement for back teeth, or in some cases, as on the masticating surface and where the appearance makes no difference, I use very frequently amalgam. For a temporary filling I think there is nothing better than pink gutta-percha. I often use it between children's teeth. If it wears out it is quickly and easily renewed, and it will prevent forcing of the food down between the teeth and impinging upon the gum, by reason of its filling up the entire space between the teeth.

Dr. Peirce stated that a year or so ago Dr. Brubaker tested some zinc-phosphate pellets for him, and it was found that lactic acid would destroy the zinc-phosphate very rapidly, while the pellets in the acetic acid for a year or so had suffered no visible disturbance. The doctor thought it was a fact worth putting on record that lactic acid dissolves the cement very rapidly, while acetic acid will not destroy it.

Dr. Truman.—This question is such a narrow one that it is difficult to talk about it. Of course there are two or three materials we can use,—gutta-percha, tin (as temporary filling), and zinc-phosphate. Those three are practically the only ones we have. I think possibly red gutta-percha is not affected by micro-organic life, while I am convinced white gutta-percha is. It decomposes on the surface with considerable rapidity. The red is, I believe, colored with vermilion; that may have a retarding influence in the development of micro-organisms. I know of no other reason, because they are practically the same. We all know that red gutta-percha will remain intact in cavities for almost an indefinite period.

I think this question of temporary fillings can hardly be considered at all without broadening the subject somewhat. It seems to me we ought to take into consideration the character of the tissue we are working upon in using temporary fillings of any kind. Their mission, of course, is to protect the teeth for a limited period. Now, how is it with teeth where the pulp is nearly exposed? Gutta-percha appears, from its expansion, to have a ten-

dency to irritate the pulp. I think in many cases this effect is noticed, and yet we have nothing better from its lack of conductivity to thermal conditions, in children especially from twelve to fourteen years of age. I think there should be placed on record a protest against the use of gold and those high conducting materials at any age before twenty, in the majority of mouths. We always forget, I think, that the dentine of each tooth is made up of a series of tubuli, which contain organic matter capable of conducting impressions, and will place in almost anything that we may have at the moment most convenient; but we cannot do it with any degree of safety, and therefore I think we ought to avoid such temporary fillings as zinc-phosphate in extremely sensitive teeth. Oyxchloride of zinc is always more or less dangerous. I prefer to paint the walls with chloro-percha and then cover with zinc-phosphate, but I never fill temporarily on the proximal surfaces without making a compound filling. To me it is a very great error to depend upon any one material for filling in teeth of that kind. We have, as has been observed by Dr. Jack, a possibility of acid destroying the filling at the cervical border, and that fact should always be borne in mind. The red form of gutta-percha will resist the action of micro-organisms at that point better than any other. If the walls are coated with a thin layer of chloro-percha and then a layer of tin, and then upon that you build zinc-phosphate, you have very nearly a permanent filling. I am well aware from clinical experience that zinc-phosphate will dissolve in some mouths. I prefer to place in tin as a temporary filling where it is possible to use it.

Dr. Neall.—If I understand the question, it is, What is the best temporary filling for a minimum of three years? It strikes me that that verges on a permanent filling. I have seen many fillings supposed to be permanent that have not lasted that length of time.

I give a good deal of praise to white gutta-percha. I have used red largely, and for two years past have employed Flagg's high-heat gutta-percha, and I have been very well pleased with it, even when used on the masticating surfaces. Sometimes a filling will last not only three, but eight, years with this agent. The qualities are brought out largely by the character of fillings, as I have learned by experience. The rubber dam should be put on carefully, the cavity dried and shaped as if it were to hold a metal filling. The first piece I warm over a pipe or spirit-lamp and make it quite soft, and pack in one after another, making the first piece adhere to the cervical border, and then trim and rub down with chloroform.

My experience leads me to regard Flagg's high-heat gutta-percha as the best temporary filling, verging upon a permanent filling.

Dr. Peirce stated that he attributed the value of red gutta-percha to the fact that it had vermilion in it, which was an antiseptic, and that it had a less amount of mineral substance than the white.

Dr. Jack mentioned a case where electric wires had been insulated with gutta-percha, which were placed underground, and it was found that wherever the wires passed beneath an oak-tree the insulation was destroyed. On investigation it was discovered that it was attacked by a low form of life which disintegrated it.

Dr. Bonwill.—I think the question was not properly framed. There are so many conditions of the teeth to be considered, and such a variety of circumstances attending the different cases, that no certain substance for filling could be named applicable to all. I favor the use of gutta-percha, and also other materials, as the different cases might require.

Dr. Bassett.—In my practice gutta-percha has occupied a very large place, but I have never been able to procure anything for a filling that would absolutely preserve a tooth for a minimum of three years. I am glad to repeat what Dr. Truman has said about the protection of certain parts of the cavity, preparatory to filling with zinc-phosphate. For me it has always failed very quickly at the cervical margins, so that I have come to rely on it less and less as a temporary filling, except in certain kinds of cavities. Gutta-percha will, for me, under all conditions, preserve the teeth better than any of the other so-called temporary fillings; but, of course, it has the fatal defect of wearing out wherever there is much mastication upon it, and also in proximal cavities. We are surprised often in finding fillings that we place in, supposedly for a few months, to last for many years. There are so many things involved that it seems impossible to set any rule for a certain length of time.

Dr. Boyce.—Dr. Neall asked the difference between gutta-perchas. It is true there is as much difference in them as there is between day and night.

The great mass of white gutta-percha is loaded with white wax or chalk, and is almost valueless. I have had pink gutta-percha become soft, as though it were rotten. So I have white gutta-percha. But, as for making it last three years, it depends upon the structure of the teeth and who is using the material.

With the great mass of mouths, especially children's, it is my sheet-anchor in preserving them from six to twenty years of age.

I have a lady now in my charge with a filling on the distal surface of the second bicuspid; she masticates on it, and there is no wear. Dr. Dixon put it in twenty years ago, and yet when I place in phosphate fillings I want to see them in six months, and if they are there I am very well pleased. I cannot explain why it is different in different mouths, nor why it is called high-grade gutta-percha.

Dr. Faught.—I think that it is impossible to speak of any filling as being either temporary or permanent, as varying conditions make it impossible to name the time of its continuance, except, possibly, as the word is used by Dr. Ottolengui, to indicate a filling placed to cover dressings used in medication of teeth, or to tide over until convenient to fill, or some such purpose. Materials to be used can only be determined by the careful consideration of pathological conditions presented. We may discuss the mechanical and chemical properties which any material has in itself to resist disintegration, but no statement can be made as to the time these qualities will remain inherent.

Dr. Head.—I think it would first mean a great deal of skill to put it in, and, in the second, great judgment in choosing materials to make it last three years, unless there was absolute control of the tooth, and the formation of it when it was made. Gutta-percha is supposed to be a temporary filling, but in many cases it is far more permanent than gold. Oxyphosphate is supposed also to be a temporary filling, but in many cases it is more permanent than anything else we can use. It seems to me the thing we could best add to a filling, to make it last certainly for three years, would be brains.

The question as to the "best methods for overcoming sensibility of the dentine by local or general means" was then taken up.

Dr. Gaskill opened the subject. He stated that he had not been able to find any remedy that was reliable in all cases. Chloride of zinc he generally used. He mentioned a case where a piece of cotton caused such pain that he could not proceed. After putting in a small crystal of chloride of zinc, he was able to go ahead with comparatively no pain. The patient stated it was the most comfortable operation she had ever had performed.

Dr. Faught stated that he had used chloride of zinc with good effect. He had also used nitrate of silver with good results.

Dr. Truman.—To properly consider this subject, physiological conditions should be taken into consideration. It is impossible to regard the pulp as simply the remnant of the original tissue in

the development of the teeth. What occasions this sensibility? All are aware there is scarcely any cavity of the mouth in which micro-organisms are not in process of development, and the product being acid, constant irritation is produced, and in proportion to the density of the tooth will be the sensation. In soft-structured teeth we find increased sensibility. If we take into consideration the fact that we have not only the normal irritation of the tube contents, but also that produced by the acids spoken of, we gain a comprehension of the philosophy of the treatment of sensitive dentine. It means that we must modify the increased sensibility by using some agent that will neutralize the acidity. It was that which led me a number of years ago to recommend the use of alkalies in preference to any of the escharotics. For this purpose bicarbonate of soda is used. If this be applied properly to neutralize acidity, there will be a marked change in the sensation.

I have observed, from microscopic examination of chalky teeth, that the organic substance of the tooth is not immediately destroyed by caries, but remains with the fibrillæ in the cavity to be irritated by the increasing acidity. The fibres have not been destroyed, as in teeth of dense structure. They can be seen permeating the organic substance, which remains as a mass in the cavity, and readily raised by the excavator. With patients whose occupations bring them in contact with saccharine or acid products at confectionery-stores or vinegar-factories, I always prescribe an alkaline wash for the teeth, at least a week before commencing operations, to be used daily.

To my mind chloride of zinc is a most dangerous agent to place in a cavity. I have always dreaded its escharotic effects. Its destructive as well as its coagulating property is apparently limited only by the quantity of albumen. It is peculiar in its action. I have tested this thoroughly in minute capillary tubes. That it will be carried to the pulp sooner or later it seems to me there can be no reasonable doubt.

A large portion of the so-called obtunders have arsenic or cocaine in them. Cocaine, to be of value, should be combined with chloroform or similar agent, but its possible effects should be well considered. No one, it is supposed, would inquire whether arsenic should be placed in a tooth. There is no agent that could possibly be worse. The death of the pulp is a certain result.

The President stated that the question was asked that the consensus of opinion might be brought out against it.

Dr. Jack.—For ordinary sensibility I find carbolic acid, combined with oil of cloves, sufficient to alleviate, but in many instances the decalcification of the dentine produces a state of hyperæsthesia of the tubular contents which demands different treatment. No operation can proceed where the degree of sensibility is such that the slightest touch is unbearable. In these cases the local means I have found most efficient are desiccation and zinc chloride. The applicability of these agents is based on the well-known principle that if a tissue is deprived of one of its elements its normal function is impaired or destroyed.

As the use of heated air is the simplest and least painful means, I first try this. I always apply the rubber dam. The cavity is bathed with absolute alcohol, when compressed air is passed through a heated air-syringe, the bulb of which is crossed by perforated diaphragms. The air in passing becomes heated, and should be brought into contact with the tooth a little above the blood-heat. If the nozzle be held too far away the current takes with it by friction the adjacent air and is made too cool; if it is placed near, the heat is too great. The application requires to be repeated several times in some instances. Often the result is extremely satisfactory; at other times the dentine will not become dried, and there is no result.

When this is the case I do not hesitate to employ zinc chloride where the cavities are comparatively shallow, and in a long experience I have not encountered the death of the pulp from this cause. The method I follow is invariably to use rubber dam. The cavity is dried and a crystal of the salt placed in it. If the deliquescence is not immediate I add a little previously deliquesced zinc chloride and await the result. Frequently one can tie up the rubber water-tight, tuck the bag in the cheek, and go on with another case.

As the extreme sensibility of the tooth is in the part immediately beneath the soft caries, it is important to remove this, if we can, to allow the chemical to act at once where most needed, otherwise two applications may be required.

When the pain has ceased I wash out the cavity and proceed to prepare it, knowing that if the instrument reaches sensibility it has passed beyond the sphere of action of the chloride, and that any uncombined salt will have been washed out by the water and saliva.

In some cases there is not the least action by the zinc chloride, which can have but one explanation, which is that the vital force of the tissue has been sufficient to prevent the combination with its

albumen. In these instances, when it is necessary to prepare the cavity and it will not receive a temporary filling of any kind, I give ether and operate at the first stage of anæsthesia whenever I can. At this stage it is more satisfactory, as the patient in this condition is able to respond to questions. I have in this stage frequently prepared the most sensitive cavities, giving a few inhalations at each recurrence of sensibility. Thus far I have experienced no indications of shock, and much less nervous depression than would follow an attempt to prepare a cavity without ether when the use of it is indicated.

Dr. Bonwill spoke of the necessity of having good sharp instruments, in order to lessen pain in operating.

The query demands an essay.

The various conditions of the dentine, involved as it is with the pulp, require antiseptic treatment.

I never use arsenic except for the destruction of the pulp. It is the best agent known, used with proper judgment.

I have tried many obtunders from electricity (to-and-fro current), carrying it from the nerve-centres to the periphery or pulp, counterbalancing the pain. It will do it in many cases.

I find now that sharp excavators, burrs, and spear-pointed drills, accompanied with a very quick, full, deep inhalation, made immediately before the instrument is placed on the sensitive bone, accomplishes good results. The stroke of this should be finished before the patient fully charges the lungs. Then desist until the lungs are again inflated, thus changing; for if the cutting begins at an improper time the patient will not inhale quickly.

To produce a more profound effect, have the patient breathe one hundred to the minute, and, while yet doing this, excavate as freely as desired. The former plan generally suffices. Never remove all the carious portion at the first sitting.

Take a piece of paper charged with creosote or carbolic acid, fit it over the bottom of the cavity, and place upon this warmed gutta-percha (pink base plate), and then let it alone for weeks and months, which will not obtund further sensibility, but wedges the teeth apart by the pressure of mastication.

The operator should be very quick in his movements; all instruments should be convenient. Three things are essential to success, —*time*, gutta-percha, and creosote. Hurried excavation and filling at the same sitting will not answer.

I would never use a hypodermic injection of any kind. I have used chloroform only in moderate quantity and in special cases.

Dr. Head.—Many remedies satisfactory in one practitioner's hands are not so in those of another. When cocaine was first introduced, a two-per-cent., then a four-per-cent., and finally a fifty-per-cent. solution was used. The method now generally pursued is that of desiccation, in conjunction with chloride of zinc; also an alcohol spray, using it after the rubber dam is adjusted. By this treatment the operation had been performed, where before a piece of cotton applied caused the greatest pain.

Dr. Luckie thought that all the obtunders placed on the market were a vanity and vexation. There is none that will answer in all cases. Cocaine had never been very satisfactory, and he attained the best results by desiccation and by using very sharp instruments. He had used etherization with good results.

After the close of the discussion it was unanimously resolved that it is never expedient to use arsenic in any form for deadening sensitive dentine.

Adjourned.

THE regular meeting was held at 1228 Walnut Street, Philadelphia, April 8, 1893. After disposing of the routine matters of the evening, the Committee on Clinics, by Dr. A. W. Deane, made a report as follows:

Dr. Genese operated this afternoon on a first bicuspid on the right side. It had received no treatment, and the gum was partly grown over the side of the root. He mounted the crown, soldered the pins, and placed the case in the mouth very satisfactorily.

(The patient was brought in and the work examined by the members present.)

Dr. Deane also stated that Mr. Kerr, representing the Downey Furnace Company, had brought in a portable furnace and baked a piece of porcelain in five to eight minutes, there being no odor or smell.

Dr. Genese, by numerous samples of teeth and crowns passed around to the members, and by drawings on the black-board and oral description, described his manner of using them and their construction. He stated that they could be procured from any dental depot, and they are manufactured by the Wilmington Dental Company.

Mr. Kerr, representing the Downey Furnace Company, said,—

"I am here to answer any questions you may like to ask in regard to its work. The crown is made of any of the teeth that are in use to-day. Grinding the teeth, except for length, is unnecessary. It is not absolutely required that it should fit the root or band. You can use it even if it is too short."

Mr. Kerr described the method of using the furnace, and stated that the time consumed in fusing the crown was only about two minutes.

At this point Dr. Genese read a paper entitled, "On Crowns."

ON CROWNS.

BY DAVID GENESE, D.D.S., BALTIMORE, MD.

CROWNING and fronting teeth, of which to-day's clinic was a practical demonstration, has been in vogue many years. Names of prominent dental practitioners have been from time to time associated with new ideas upon the subject, and I have only submitted for your consideration eclectic points culled from the different methods known to us to simplify our work, and used with greater

ease to the patient, precision in adjusting, natural appearance, and lastly, though not the least, with less destruction to the root and its organism.

My earliest recollection of this class of work is a natural tooth-crown, drilled through and countersunk like the Bonwill, affixed to the root by a leaden pivot pressed into the root, previously shaped to hold the lead, which pressed through the natural tooth and was hammered tightly in its place.

Work of this character is illustrated by specimens presented by me to the Maryland University.

The introduction of porcelain teeth produced a marked improvement in this branch of dentistry, and brought to us many methods of crowning, such as the Howe, Gates, Bonwill, Rynear, and numerous gold-crown systems. The latter I leave to the good judgment of the admirers of a natural appearance in the mouth to decide their merits. A free edge near the gingival border is objectionable, while the destruction of the attachment of the gum margin to the root is a serious defect.

What I endeavored to obtain by the method shown to-day is conservation of the root with its marginal covering, also to avoid the necessity of reaming or drilling the pulp-canal to a given size to fit a pivot already formed irrespective of the conditions that might be found, and to adjust a bifurcated pivot so exactly that no undue strain should be the result to cause irritation after the crown was in place, and to have the pivot so under control that should a curve be in the root it will adapt itself to it, avoiding that distressing cause of so much trouble in pivoting,—pressing the sides of the root into the alveolar process, with its train of troubles.

To the gentlemen who were not at the clinic I would briefly state that these crowns are made to conform as nearly as possible to the natural roots found in a number of models, with sufficient porcelain left on them to allow for grinding in any direction, their density permitting them to be repolished.

A cup of irido-platinum is burnt into them, which has a head pressed upon it to prevent pulling out. It can be subjected to heat sufficient to melt pure gold without fear of cracking, as the tubular form allows it to shrink indefinitely, making at each firing a tighter hold on the platinum lining, as shown in specimens passed around.

The pivot is of the same platinum, formed from the sheet, and left hollow to allow for fitting into the canal its entire length. This can be kept hollow by plugging with asbestos or made solid by drawing the solder into it by the flux.

By this system you will see that the pivot and crown are independently fitted to the root, and when soldered will occupy exactly their relative positions to each other, requiring very little cement to hold them in place.

Apart from this, each step of the work is under close inspection with mirror and models and by the point of instruments to detect any overlap, and the extra length of porcelain allows for grinding, fitting, and placing the crown at any angle independently of the pivot.

The soldering process is rendered safe and simple by the use of the little holder of pin metal and Teague's investing compound, as shown in specimens, which holds the post and tooth in position. The flame should be directed well onto the body of the tooth in soldering, rendering it the hottest part when solder flows, and the specimen in sections will demonstrate the union of tooth and pivot.

The higher the standard of solder used the better the result, as platinum cannot be properly soldered with poor metal.

Pure silver or gold or 18-carat plate gives the best result.

For accuracy of adjusting, models are taken after the root is prepared; the crown is fitted and articulated, and tried in its place, the hollow is filled with Parr's wax flux, which prevents grit from the wheels or any substance being in the platinum cup that might interfere with soldering. The pivot in its place, and the crown already proved correct, warm the wax and adjust to position, then cool. When withdrawn, invest as shown by model and solder. Ten minutes after, the crown is ready to place in position.

The usual precaution of sealing the apex and drying the canal is needed. Gutta-percha is good in some cases, but I prefer fossiline, imported from Europe. It wears well, is a safe and easily-worked oxyphosphate, not setting too quickly, very adhesive and durable, while its chief advantage is intense hardness soon after fixing, and retaining its density, though mixed thinner than most of its similar compounds.

In finally adjusting the crown I place a wooden point on the automatic hammer and tap it a few times, forcing the crown to its closest adaptation and driving off the excess of cement.

It sets hard enough in ten minutes to allow grinding the crown, should the articulation require it.

If hurried from any cause, these crowns can be set by this cement without soldering, and will last several months. To those who prefer banding, this crown presents the strongest air-tight collar; no possibility of fluid entering between the metal and tooth,

and the least amount of gold showing, as the edges are made flush with porcelain, as shown in specimen.

DISCUSSION.

After reading the paper, in answer to some questions put by the members, Dr. Genese remarked,—

"I can record about four hundred cases where these have been inserted. In the earlier stages we had some trouble, but by the process of heating the platina all that has been avoided. The only difficulty I had in the earlier operations was that of the platina box pulling out.

"The porcelain is of the very densest character, similar to that of Ash's porcelain, of London, and the more it is baked the better it gets, and the more it shrinks the tighter it is set in the box. There is no fear of its expanding or cracking after it is set. As a crucial test to which it was put I would refer to that of placing it on the anvil before it became cool, and cooling it rapidly within five minutes after soldering. So if there was any possibility of its cracking it would crack then.

"In the mouth, in masticating, they last exceedingly well. You can grind them to the thinnest possible edge without breaking. The pivot fits into the cavity its whole length, and in cementing, the extra cement will enter the box of the tooth and make it a solid crown and the tooth a homogeneous whole. One, two, or three pivots can be placed in the tooth as well as a single one."

In response to a question as to bridgework, the doctor said, "I have a special form for bridgework; not of that kind of crown, but one very similar to it. It has also the platina barbs inserted on the same plan."

Dr. Bonwill followed Dr. Genese, remarking,—

"I would like to congratulate everybody in making a move in the right direction and doing something that has not been done before.

"I see but one thing new about this, and that is the little porcelain strip fastened in the base of the tooth for soldering, which I cannot see is of any use, because a porcelain crown can be made of a shape that it is almost impossible to break in the mouth, if it is made of proper material, and without soldering and without platina; besides, I don't believe in the principle of placing a pin in the crown of the tooth. Many roots, in order to get in a pin of proper size, have to be cut so thoroughly to pieces that they spread and split, and it will be found that the oxyphosphate will be eaten out.

"The Logan crown is this exactly, except that it is infinitely stronger, cheaper, and easier put in. I would not take the trouble to adjust two pins and solder them, when I can do it more readily with all-porcelain English crowns. The only thing about it is a platina lining, which I always cut out to make the room larger in order to make it adjustable. An English crown placed in and thoroughly anchored in the root of the tooth is one of the strongest crowns that has ever been made. Don't use any with a pin in it. Anchor the pin thoroughly with anything of the character of oxyphosphate, and you can put them on without any trouble."

Dr. Genese.—My friend Dr. Bonwill has been contradicting himself. He first tells us he does not want a pin in the root, and then tells us to use a strong one. I came here with the idea of a system of pivoting porcelain teeth without reaming them out.

In answer to one objection of Dr. Bonwill's, Dr. Genese said, "My assistant happened to put a silver pin in the tooth I used today, and I thought it was platina. The silver melted in the box, and that left me with one root or one pivot standing in the tooth; to go through the work again and fix the pivot was more labor than I cared to take, so I simply cemented my second pivot into the tooth, as Dr. Bonwill advises, and then I put my tooth on one root and soldered the tooth to one pivot and the other pivot cemented in the root with oxyphosphate in the box of the tooth itself, thus carrying out both ideas, with the exception that I did not ream the roots out for fear of running through the sides and producing irritation.

"I differ with Dr. Bonwill as to the holding of an all-porcelain crown by itself on to the root, either by screwing it into its place or by oxyphosphate, with any porcelain we have at our command at the present time. If you dovetail your root, it must either be a true dovetail or the cavity must run right through the tooth and dovetail it on the grinding surface. If you do this the oxyphosphate or amalgam filling will wear away, or the porcelain crown will be discolored by the material used. The porcelain will not permit discoloration.

"I do not claim so much originality in it, but still think I have made a step in the right direction in simplifying the methods of crowning, both to patient and operator.

"There is another little advantage in these crowns that will meet many of the wants of the practitioner at a distance. The root can be prepared and a model sent to the depot, and a crown can be returned so nearly what is desired that there is very little

trouble in fitting it. With the Logan root there is a doubt whether it will go in its place or not."

In speaking of the wax used, Dr. Genese said he used Parr's, stating that it remains in the box of the tooth and acts as a flux, so that the work is not disturbed in soldering, and the investment does not need to be wet to scald it out. The doctor stated that he did not trust to it entirely, but dusted it with a little calcined borax to prevent the solder from exuding while it is being invested. A patient can ordinarily be dismissed in forty minutes with a perfect crown.

"The investment is Teague's compound, of Aiken, South Carolina, and while on the subject it may be of interest to you to know that this substance is good, not only as an investment for crowns, but for bridgework. In taking impressions of the mouth it can be used exactly the same as plaster. Pure gold can be heated in it, so that it can be understood that zinc or any other metal required can be used. A perfect result is assured. Mix it up with water in the same way as plaster. It can be smoothed, and manipulate it by adding a little water before it is quite set, which will give a perfectly smooth surface. It can be dried out and soldered in ten minutes from the time it is invested. I do not know its composition, but it is made from some fossil remains found in Florida. The Wilmington Manufacturing Company have special machinery for grinding it.

"I soldered that [exhibiting a case] in ten minutes after it was put in the case, a thing impossible with sand or plaster or any other compound.

"I have also found it very satisfactory in bridgework."

The fifth question submitted to the Society was then taken up for discussion, the subject being, "What are the Best Forms for Partial Lower Dentures, and Methods of constructing them?"

The President, Dr. Jack, stated that as he understood it the question was capable of two divisions,—what may be called three-fourths cases and the other full lower dentures. The three-fourths case is confessedly the one most used in dental prosthesis.

Dr. Genese submitted some specimens pertaining to the subject for discussion, and said, "These are all made for practical work; some temporary cases, others duplicates. They embrace most of the forms that will be met with in general practice, from one or two to a complete set. A great deal depends on the margins, the smooth finish of the work, and, above all, absolute freedom from pressure of the muscles of the lower jaw."

The doctor exhibited a case from his own mouth, which he stated he had worn for twenty-three years, and which had been mounted twice, and showed how it had been repaired without a band or fastener of any kind.

"In making partial dentures I dislike to have metal come in contact with the gum. I would trust more to a small wing of rubber to go around the gum to keep them down until the muscles become accustomed to the strange feeling. I take advantage of the leaning forward of the last molars, and get it well under and then drop it down like a bent hook. In complete dentures I use the spiral springs. They are very useful, though I find they are very little known in this country. They are wound with eighteen-carat spring-wire, with a swivel and a small hook and screw between the lower ones to prevent going into the muscles of the jaw, and retain the denture in the mouth exceedingly well for a number of years before breaking."

Dr. Deane.—I have had more or less success and a good many failures, but have had more success with gold than with rubber, taking a plaster impression and making the cases very small. As a friend of mine, Mr. Frank Faber, once said, "File your lower case until you think you have spoiled it, and file it again until you think it will fit." I have followed that idea out with about as much success as it is possible to get. Simply fit the ridge of the jaw, and if there is no ridge, still hold to that law, and the articulation being as perfect as it is possible to get it, you will meet with more success than to trust to wide and bulky pieces of rubber or metal.

I think if the pieces passed around are not allowed to lap over the jaws, the fit will be more accurate and they will create less friction on the tooth at the band. I make the band of as near pure gold as I can get, very thin and small. Sometimes I find it necessary to cut it into two or three pieces, and then swedge and solder.

Dr. Nichol.—I have prepared these cases, using gold for partial lower dentures where the incisors are in position, and sometimes the first bicuspid, the object being to prevent the plate from pressing to the back part of the mouth. They are used when there is no molar to prevent the plate being driven posteriorly. The plate is swedged in the usual way, the band extending around the ridge just below the incisor tooth, and the whole put in the mouth and filed nicely to fit. An impression is then taken, and the whole invested and soldered in that way. The purpose is to get a band of gold broad enough to prevent cutting into the ridge running

around the front of the tooth or the ridge just below the teeth. One of the advantages is to prevent the necessity of using clasps. It is rarely that a bicuspid can be clasped with satisfaction, as it is not adapted for it, and I think this method secures better results than clasping. It avoids the band that Dr. Genese speaks of, and makes a very firm and substantial plate.

Dr. Bonwill.—It is not surprising that this query should be made. For nearly forty years I have been looking at the vacancies in the lower jaw from the loss of the second bicuspid and first molar, and often the first bicuspid, leaving the second molar intact, with the cuspid in front, and in many other cases where there is nothing remaining posterior to the six anterior teeth.

The presumption is that the person formulating this question must have felt his own need in practice, but was not conversant with the history of artificial dentistry.

How few dentists have ever undertaken to fill such spaces, and how many failures are made when attempted! I think the question should have been framed, "Have we any means at present for satisfactory restoration of partial spaces in the lower jaw?"

If modern dentistry has a stain upon it, it is that such a question should have to be asked.

Efforts have been made that fully justify me in stating a method that perfectly restores the lower jaw to its normal action. Dentists are certainly either very obtuse or wanting in mechanical manipulation, or prejudiced against any plan or substitute when done by any one else than themselves.

A new method of clasping has lately been shown you that it would be well for every one here to try before he attempts to ask for anything new.

If those present will but recall an article I read before this Society several years ago, and at which time I gave a demonstration in my own mouth, as well as in others, and which for some reason was delayed in publication until a few months ago (see International Dental Journal), I am sure they will find it worthy of some consideration.

To me it has been the addition of a new arm to my practice, and there is no one thing I have ever devised that gives so much satisfaction to my patients and to those dentists who have tried it.

Then, when I am asked such a question as No. 5 of this series of the learned heads of our profession, I feel somewhat like saying to such, Would you know a good thing if you saw it? Why do you, who appreciate the needs, not go to work and do, and not

ask to have others exhaust their brains, and then give their efforts no attention?

All I have to say in conclusion is, that if you will read the literature of our profession, and learn to minutely follow details and make yourselves competent in mechanical art and skill, there will not be so many queries made, but we will have effort,—active demonstrations by the dozen coming from every one of you who have the slightest conception of creating a substitute for lost organs in the human jaw.

I would again refer you to the published article in the February number of the INTERNATIONAL DENTAL JOURNAL, and you can see in my own mouth results of years, and a few unfinished cases I have here on exhibition, which, if not enough for the dissatisfied, I cannot offer you any more plans for the present.

Dr. Deane.—I think a great deal of the riding backward can be avoided by articulation. If the tooth was so ground as to form an inclined plane, this posterior movement that annoys us a great deal would in a measure be avoided, as I find it quite successful.

THE regular meeting was held at 1228 Walnut Street, Philadelphia, May 13, 1893.

The subject for discussion was "Corrective Dentistry: Its Present Status."

The President, Dr. Louis Jack, called upon Dr. Guilford.

Dr. Guilford opened his remarks by stating that Dr. Bonwill could not have read his work on orthodontia carefully, for if he had he would have noticed a description and illustration of the appliance described by Dr. Bonwill, and properly credited to Dr. H. A. Baker, of Boston.

Continuing, Dr. Guilford said, "Appliances for the correction of irregularity are so varied in character and great in number that we can only take time to speak of them in a general way.

"In the earlier days force was principally derived from the elasticity of metals in the form of bars and springs, sometimes assisted incidentally with ligatures and wooden wedges; but after the introduction of caoutchouc, rings cut from rubber tubing and vulcanite plates were added to our list of materials available for exerting power. The latter, on account of their great adaptability and ease of construction, for many years largely superseded the use of metals, but the tendency nowadays seems to be to return to the use of metallic appliances, not only on account of their greater power, but because of their directness of action and their occupancy of less space in the mouth. In their construction the more expensive metals, such as gold, platinum, and their combinations, were formerly used; but with the advent of steel in the form of piano-wire and the introduction of German silver, it was found that equally efficient appliances could be constructed and at less cost. For this reason they have come into very general use. The chief objection to their employment is their oxidability, which soon renders them unsightly and seriously interferes with the movement of parts, such as nuts upon bolts and rods in tubes. To avoid this I was led to use platinized silver, which does not tarnish like German silver, and which, unlike steel, can be joined with hard solder without injuring its properties.

"It is an alloy composed of one part of platinum to two of silver, and was introduced from England, where for many years it has been used in the form of wire posts for the support of tube-teeth and in sheet form as a base for partial dentures. Its elasticity is little less than that of platinized gold, while its cost is about one-third that of gold.

"Its many valuable properties render it a most useful and serviceable material, and I now use it almost to the exclusion of other metals in the construction of all parts of regulating appliances.

"Rubber or vulcanite plates serve an admirable purpose in expanding the arch and in producing many simple movements of teeth, but the necessity for removing them at times for cleansing often tempts the patient to remove them when they should not be removed, and thus our results are frequently delayed and sometimes greatly interfered with. It is best not to confine one's self to any single system or method in regulating, but to use such parts of any method or to devise such appliance as seems best adapted for the case in hand.

"In regard to retaining devices, I think that in nearly all cases they should be of such character as to be non-removable, for in removing and replacing them the teeth are more or less disturbed, and this hinders their growing firm in their new positions. Retaining fixtures serve their purpose best when cemented to the teeth and left there for a period of not less than six months. Appliances attached to teeth by means of bands or clasps will after a long time cause injury to the teeth, but when cemented in place no injury will result."

Dr. Darby.—I think since the year 1871, when I heard Dr. Walter Coffin, of London, describe his method of using rubber plates in connection with piano-wire springs, I have used them more than ever before, and with increasing favor. There are many cases of irregularity where a rubber plate and a spring of piano-wire are all that is needed to accomplish the desired correction.

I have frequently corrected difficult and complicated cases with a single rubber plate to which had been attached springs and screws, some at the time the plate was made, others subsequently, as the malposed teeth had moved into their desired position.

The rubber plate possesses two desirable features,—namely, a minimum amount of skill for its construction as well as a minimum expense, which is often a serious matter when precious metals are used and a number of appliances required.

To-day I inserted a little fixture for the purpose of pushing into the arch a lateral incisor which was within the line of the other teeth. There was room for it between the central and cuspid, but it was held in its abnormal position by the occlusion of the inferior lateral. A rubber plate was made capping the molars. That portion of the plate fitting against the palatine surface of the incisors was left quite thick, and opposite the malposed lateral a screw was embedded in

the rubber. The screw was headless, and the slotted end of the screw rested upon the palatine surface of the lateral. The patient was given a small screw-driver, and requested to back that screw out a turn or half a turn twice or thrice daily, and then force the plate into position. As the plate bound the molars tightly, there was no slipping from its position when once forced into place by the lower teeth. If the girl is faithful in her use of the screw-driver the tooth will be in line in two or three weeks.

Such an appliance need not cost over two or three dollars, and the patient corrects the irregularity.

Rubber plates are a little cumbersome, and they are in many cases unclean, but this is the fault of the patient.

While I would not recommend them in all cases, I would not like to discontinue their use, nor have them condemned without a hearing.

Dr. Jack submitted a plate that he generally uses for carrying teeth out or drawing them inward. The plate was passed around among the members, and after illustrating the points upon which he wished to make his remarks by a black-board drawing, he said,—

"I want to call your attention to a form of plate I have been using for a great many years for the general purpose of aligning irregular front teeth and for forcing outward or inward the eight front teeth of either arch.

"In reference to the alignment of teeth, carrying them in when they are too far out and bringing them out when they are too far in, I use this plate almost invariably. It is composed of two pieces of vulcanite joined by a band of gold. (See Fig. 1.)

"The posterior teeth are made the base of resistance by covering the second bicuspid and the molars of both sides by two separate shoes of vulcanite, which extend at either side of the teeth but a few lines beyond the margin of the gum. To give these shoes strength and to enable the patients to masticate upon them, they are surfaced with gold swaged to the form of the ends of the teeth. These gold facings are vulcanized to the shoes in their proper places.

"Some preliminary preparation of the cast is required to enable these shoes to hold firmly their position. They should go on with a little springiness. The cast is trimmed with a suitable instrument to take a shaving from the teeth at the neck, and also a shallow groove should in most instances be made in the plaster, at the gingival margin. The proper amount of cutting is quickly gained by experience.

"These bases of support for the movement of the teeth are connected by a narrow band of springy gold, one end of the bar being secured to one of the shoes, the other end being attached to the opposite shoe by a male screw fitting in a screw-cut tube or, with proper precautions, vulcanized into a projection on the outer plate of the shoe.

"The reason for this plan is that by turning the free end of the appliance the bar may be reduced or increased in length. If in any given arch a tooth or more is projecting and others are depressed, the bar is brought into contact with the most prominent tooth, and a piece of elastic rubber is placed between this point of contact, at the same time a rubber ring is carried over each of the teeth which are within the arch and is drawn through a hole opposite the tooth and extended to a button. On the next day the bar is screwed up enough to be again in contact, when a new pressure may be made or the tooth is rested, as the conditions require. If the depressed teeth are sore, they may be rested by tying through the same channel as the ring had passed. I remove these plates daily, each time making a gain in the progress. It is important to make this daily change for the sake of cleanliness, the patient brushing the teeth while the further preparations are being made.

"As before intimated, all the front teeth may be moved at the same time either outward or inward.

"Rotation may also be conducted by the various attachments made for that purpose by connecting the rubber band to the attachment, and many modifications of this simple description will occur to meet the exigencies connected with the alignment of the teeth.

"It is almost needless to state that the impression of the teeth should be taken with plaster.

"This method may be made useful in the treatment of cases at a distance whenever either of the parents of the child has the intelligence to comprehend the mode of operation of the plate and is capable of applying the required instruction. In this connection I have conducted the correction of a great protrusion of the upper teeth and concurrent depression of the lower arch for a patient living a thousand miles from me, the mother each day making the necessary changes of the plate or ligatures. The upper teeth were forced backward in the manner described, and when their position was corrected, a similar plate was placed on the lower teeth, when they were gradually brought outward into correct relation with the upper arch. This necessitated but three periods of attention on my part.

"The only originality in connection with this appliance is the

division of the old form of upper plate which was used to separate interlocked arches and to connect these by the screw at one end of the bar. I present this method to you as comprising many advantages for the purpose for which it is intended, and in this purpose is included the greater number of irregularities we have to treat.

"For the rotation of teeth and for bodily moving them on the line of the arch, my opinion is that no means are so effectual as the attachment of a screw connected with fixtures which are cemented to the base of resistance and to the irregularly-placed tooth.

"In reference to retaining fixtures, I employ the methods Dr. Guilford has mentioned to you. I invest the teeth with a fixture which is cemented firmly in place, sometimes covering the teeth entirely, at other times leaving a portion open. Sometimes I make them very extensive, covering the incisors, cuspids, and bicuspids. These are cemented on with oxyphosphate of zinc, and are worn from six to nine months."

This closed the discussion of the subject.

Dr. Deane, under "Incidents of Practice," asked the advice of the members as to how to proceed in a case he had, where a boy, about thirteen years of age, had fallen against a curb-stone and broken off the right central about three-fourths of its length; the opening at the apex of the root was quite large. Would it be better to restore the crown? The root is in good condition, except that the apex of the root is not closed. Should it be extracted or left as it is?

Dr. Truman suggested the use of oxychloride of zinc.

Dr. Darby stated that in a somewhat similar case he made a little piece of gold to go into the canal, with a thread cut upon it. He suggested mounting the crown.

Dr. Gaskill stated a case where a tooth had been broken off and subsequently gave the person trouble. Upon examining the tooth he found an opening an eighth of an inch in diameter. A piece of tooth-brush handle was taken and made to fit the cavity exactly, and coated with chlora-percha, inserted in the root, and a crown mounted. It had served the purpose very well, with no subsequent trouble.

Dr. Boice stated that he had a case a number of years ago in which the apex was larger than any part of the canal. In drilling it out he had to hold the tooth. Finally, it was filled with cotton, expecting the patient to come back in a few months, but it was sixteen or seventeen years ago and had given satisfaction all that time.

Dr. Jack stated that he had the history of four such cases. He measured the exact distance to the end of the root with a broach; then fitted a steel probe by filing it to fit exactly the apical opening, and cut it off at a point where it would not go through; this gives the exact size of the opening; he then prepares a cylinder of gutta-percha on a warmed porcelain plate to the proper size; then cuts a section of the cylinder at a point a little larger than the piece of steel. This is next attached to the probe, carried up and forced by measure to the proper place, the gutta-percha being obliged to adapt itself to the form of the canal at the apex. Afterwards the remainder of the root is carefully filled.

Dr. Guilford called the attention of the members to the adaptability of platinized silver for dowels, being less expensive than gold, and standing any amount of heat any article can be subjected to except platinum. The doctor stated that he frequently soldered it with 20-carat gold. It has not quite the stiffness of platinized gold, but where less stiffness is required it answers the purpose perfectly well. It can be bought of Ash & Son, New York.

Dr. Bonwill then read a proposition for the consideration of the Society in regard to the proper disposition of patented articles.

After Dr. Bonwill had read his paper, the consideration of his proposition was taken up and opened by Dr. Boice, who said that he understood Dr. Bonwill had something which he wanted to present to the Society; that he had given a good lecture on patents but was not able to see that the doctor had given the Society anything. Dr. Boice further said that he did not feel that he could offer any motion accepting anything that had not been offered.

Dr. Bonwill answered that if there were no clause in it upon which they could take action they might accept it and place it before the American Dental Protective Association.

Dr. McQuillen stated that, as he understood it, Dr. Bonwill wanted the Society to go on record as favoring patents of all kinds, and to present this paper with its endorsement.

Dr. Truman.—Dr. Bonwill desires that this Society shall refer this matter to the American Dental Protective Association. In doing that, as I apprehend it, we do not endorse it.

Dr. Darby moved to place it before the American Dental Protective Association, with a disclaimer of any endorsement.

This motion was carried.

THE regular meeting was held June 10, 1893. Vice-President Dr. C. R. Jefferis in the chair.

Before the question of the evening was taken up for discussion, Dr. Truman exhibited the Morgan-Maxfield disk-mandrel, as many present were not familiar with it. Its great simplicity, admitting of rapid changes in the disk, and firm retention constitute its principal advantage over some in the market.

Dr. Boice mentioned the case of a lady who had lately been treated by physicians for some lesion supposed to be connected with the ear, but which he demonstrated to have its origin in a wisdom-tooth. The pulp was exposed, and the application of sulphate of morphia allayed the pain. The pain in the ear was altogether of a reflex character.

The question of the evening was then taken up for consideration: "To what Extent and under what Conditions are the Collar and Crown the Cause of Pericemental Inflammation?"

Dr. Kirk opened the discussion. He said, "All subjects of this character present two phases. The first, the practical or utilitarian side, and, second, that of the philosophical or scientific, from which we deduce certain principles or rules for the application of the art. In that view, it seems to me, it will be better to invert the order of the question, and say, Under what conditions and to what extent is the collar-crown a cause of pericemental irritation?

"In the first place, the collar-crown, as I understand it, includes all crowns of the Richmond type, and will also include any crown in which a collar is made to encircle the root. The only proper answer to the first part of the question seems to me to be, when it is an irritant, and that brings out the question of the conditions under which it may be an irritant. It may become such when the crown is improperly constructed. The accurate fit of a crown implies the proper preparation of the root and the proper preparation of the crown. The greatest source of failure in crown-work is when an attempt is made to fit a collar and crown to a root which is flaring at the free end. It is a mechanical impossibility to make a band fit a root in the mouth which has a flaring end. The flaring root-end with a band placed upon it produces a V-shaped gutter around the root which affords a lodging-place for food *débris*, and the margin of the gum becomes inflamed in consequence. There is a parallelism in the case of inflammation by reason of an irritating collar and inflammation about a tooth suffering from pyorrhœa alveolaris. The ragged edges and imperfect finish of the

collar is an important item, but I think one of less importance than the first-named cause,—viz., imperfect adaptation of the collar to the flaring root-end. Drs. Black, Barrett, and some others hold that under certain systemic conditions irritation of the pericemental membrane produces a deposit of sanguinary tartar which becomes a local irritant. Both of them hold that such deposit may take place without the previous formation of a pus-pocket similarly to arthritic deposits in the tissues about a joint. This I never have been able to establish definitely; but we do have irritation at times from a band encircling the root, and subsequent conditions similar to those present wherever we have a deposit of sanguinary tartar. From the irritation of the collar-crown we have a subacute or chronic form of inflammation on which from time to time develop periodical attacks of acute inflammation exactly similar to that which we have in typical forms of pyorrhœa.

"The question of the depth to which the band is forced under the gum is, I believe, of less importance than that of its adaptation. It is remarkable to what an extent a collar may be forced under the gum, if it accurately fits the root, if all the free edges are burnished down, without producing irritation. If it be a question of fit and depth of collar, it is important that this depth should be accurately gauged, and the fit should be carefully made.

"Another important point is the restoration of the anatomical contour of that portion of the root which has been removed. I present for your inspection two pieces which, to my mind, are ideal crowns in their construction, and a crown so made would not produce irritation to the gum. These are crowns figured in the *Dental Cosmos*, made by Dr. Shields, of New York. I have never seen any work that is so nearly perfect in its adaptation as that which he has made. His method is fully described in the *Dental Cosmos*, but as the illustrations do not show the remarkable beauty of the work, I brought these samples for inspection.

"The circumstances which are likely to produce irritation are those of imperfect fit and heavy, irregular edges. As to the extent of irritation it seems to me equally clear. It may go on until the tooth is completely lost by continued inflammatory action, the same as pyorrhœa removes the tooth from the socket."

Dr. Deane.—There seems to be nothing left unsaid by the former speaker on this subject, but I cannot agree fully with all of his remarks. I understood Dr. Kirk to say it was not material to him how far the band may be driven up on the neck of the root if it be a fit. I believe there is a limit to this, and you have reached that

at the alveolus. To force a foreign body above this line will cause irritation, and through the different stages we reach suppuration. I have in mind a case which illustrates this. A lady called about a year ago with the left superior bicuspid capped with a gold crown very loose and the root very much inflamed. A discharge of healthy pus appeared on the distal margin of the gum, and the tooth was extremely sore to the touch. I succeeded in removing the crown, and as I have it here, you can examine it. The distal portion of the crown was left somewhat longer than the balance. I found, on examining the root, that this was done in order to cover a space destroyed by decay, that portion of the root being completely destroyed up to and above the alveolar line. After a few days' careful treatment the flow of pus had disappeared, the soreness left the root, and, much against the patient's will, I made an effort to restore the parts. I first set a post of wood into the root, extending down below the gum-margin, then with a thin matrix of platinum forced up the distal side of the root until it passed the alveolus. I formed a cavity for an amalgam filling, packing this with a quick-setting amalgam. I removed the matrix, withdrew the wooden plug, and I had restored the original contour of the root. A so-called Richmond crown was mounted. I saw the patient yesterday, a lapse of about one year's time since the operation, and she assures me she does not realize any trouble in the case at all. This and some others convince me that we must not band the roots too high. And again, this trouble is increased by allowing the surplus of phosphate of zinc to be forced out around the band rather than place a vent for it in the crown of the tooth; the latter method I believe to be preferable. To my mind, a band around the root of sufficient width to protect the root and keep it from splitting ought not to cause pericemental inflammation.

Dr. Kirk stated that Dr. Deane had misunderstood him; that he freely acknowledged that it was a source of irritation, but he thought less than that of an ill fit. He agreed with Dr. Deane that it should be simply butted up against the pericemental membrane.

Dr. Truman.—One expression in the remarks made this evening by several seems to me to imply a degree of ignorance, and should not be used, and that is, "Nature tolerates." According to my view, all operations of nature are governed by law, and is, therefore, universal in its application. There may be apparent exceptions, but it is our duty to discover the cause of these. Where there is apparent antagonism to the universal law of irritation, there is a reason for it not to be explained by the phrase, Nature tolerates it.

Wherever there is roughness or space between the band and the root there will arise fermentation through the development of micro-organic life, and this will act upon the pericementum and finally end in its destruction. The objection that I have always held to banding teeth, while it has been modified in the course of years, still holds in regard to this treatment. As a rule, if a band is forced down on the pericementum, it is a reasonable inference that inflammation will follow. The pericementum is a delicate organ. Undue irritation will arouse inflammation. The symptoms are precisely the same, in my judgment, to those found in pyorrhœa alveolaris, and while this subject is not up for discussion, it can hardly be passed over, because the action of a band where it produces irritation simulates exactly that condition. You can have pyorrhœa produced by irritation, and that may proceed from a slight disturbance of the parts, and then extend to the pericementum. This may be produced by ligature or rubber dam. You have all noticed the bleeding of the gums upon the use of the brush. If you examine the gums you will find a red line on one or more of the teeth, and that line is simply the beginning of inflammation, and it will occur when a band is put on a tooth, unless it is perfectly made, and I question the possibility of making one absolutely perfect. The reason many do not produce irritation is simply the temporary effect of the phosphate of zinc; as long as that remains intact there may be no trouble, but as soon as the smooth surface gives place to the roughness, caused by acid action, the conditions are present for irritation.

Dr. Woodward.—I saw a case a few years ago, after the Richmond crown was first brought forward, in which a crown had been placed upon a bicuspid root. The root was one which tapered rapidly from the gum to the apex. In less than six weeks after it was put in the patient removed it with the thumb and forefinger, and with it came a piece of the alveolar process. This was the result of a band around the neck of the tooth.

My experience with the collar is that if it fits the root closely you will get very little irritation, but the gum invariably recedes from the collar. In time the band, which was once covered, will be found to be uncovered. In cases where the gum does not recede there is usually a low form of inflammatory action. I think if anything interferes with the attachment of the gum to the root, whether it be a piece of rubber or a ligature or a wedge or any substance, it will be followed sooner or later by recession of the gums. It naturally recedes as we grow older, and horse-jockeys

take advantage of that fact when they want to buy or sell a horse.

Some years ago I filled two teeth for a gentleman, and had great difficulty in keeping my rubber above the cervical margins. Eight years afterwards the gum had receded to such an extent that I wondered that it had ever given me any trouble to keep the rubber dam on.

Dr. Boice, by drawings on the blackboard, described a case of a central incisor, broken off, and which he had built up for a patient. He first forced in cotton saturated with varnish, and used gutta-percha, wax, and chalk; coated it over until the gums would not bleed, and then proceeded to fit a brown or gold ferrule over the free margin, and inserted a post to hold it in place; then filled with amalgam, and fitted a crown. It had produced no irritation.

Dr. Gaskill stated that he had had a case three years ago similar to the one shown by Dr. Boice, and that it had produced no trouble.

Dr. Pierce, in answer to Dr. Truman's remarks, said, "In speaking of nature's toleration I had reference to the different conditions of patients and the success that was attained when working under adverse circumstances. My surprise has been that nature so readily tolerates the application of crowns or caps or collars on the roots of teeth. Of all placed in the mouth, there are very few that have the adaptation of those exhibited here to-night, and yet a large proportion are worn for years with great comfort, and they are tolerated by nature, though not fitting accurately. There are hundreds of caps and collars put in that do not have the adaptation described by Dr. Kirk. The irritation that we have usually caused by the collar and cap is as much from the improper condition of the root as from the fact that it wears a collar. Although the operation is not a complete success, so far as workmanship is concerned, yet the absence of fit is not always the source of irritation."

Dr. Bonwill.—I ought not to say one word on crowns after I have spoken so often on the subject. Every one knows that I am opposed upon principle to a collar being placed upon a tooth. I cannot see where strength is increased, yet some claim there is, and that it prevents the cement used to secure it from becoming injured. My experience began in 1873, when I first put on a crown independent of a wood pivot. I went to all extremes in taking anything and everything offered me. I wanted to see what was the farthest extent I could go to. If we examine the teeth that are

to-day pivoted by the average dentists, we find there is very little decay in the root of the tooth. So far as injury to the pericemental membrane is concerned, I have a tooth here treated by a dentist in the country. When it came to me it was in a general state of ulceration from the apex. You can see the condition in which the band was placed in the mouth. The pericemental membrane was entirely gone. I suppose the cause of it was the collar. I know that for ten years before the tooth had had a gold filling in it. The gentleman was in the country when the tooth troubled him, and he went to the nearest dentist, who placed this crown, and the consequence was its entire destruction. Without a collar it would have been in his mouth to-day. I have one here I placed in fifteen years ago with a nut and screw. Finally, a large part of it broke away. I filled it in with amalgam, and had no idea it was so rough until it came out. It lasted for seven years in that condition. Judging from the number of cases I have seen treated in the hands of others, I see no reason to change my views. There are a few cases where I would put on a collar, but would cement it with a pin in the root of the tooth, then I would have something by which I could hold it, and it could not move; but to depend on pushing a crown with a band on it with ordinary cement, and expect that collar to sustain the root, it will not do it. If you put it up high it will produce inflammation that will destroy the tooth. So my experience has been against collars, and especially the manner in which they are placed.

The specimens exhibited here to-night show that any one who knows how and where to cut can do it, but it cannot be done in the mouth. (Dr. Kirk, in answer to a question of Dr. Bonwill's, replied that the work was not done in the mouth.) There is no use of bringing such samples here and expecting us to do it. They are entirely misleading. Dr. Kirk does not expect to make such successes as that. I object to so much gold upon the cutting edges and upon the grinding surface of the tooth as you are compelled to put to keep them from being fractured.

THE first regular meeting of the winter series was held at No. 1228 Walnut Street, the President, Dr. E. T. Darby, in the chair.

The President stated that there was every reason to expect interesting meetings during the winter. Papers have been promised by men whose names and standing in the profession are sufficient to satisfy the members that they will be of the most interesting character.

The President urged every member to attend and bring others as often as possible. There was no reason, he said, why the Odontological Society of Pennsylvania should not take a stand and position equal to any in the country.

After reading the minutes and resolutions upon the death of Dr. Dixon, it was suggested that some account of the Dental Congress held in Chicago might be of interest.

The President stated that through some oversight no delegates had been appointed, and asked Dr. McQuillen to give his experience.

Dr. McQuillen.—The Congress was a large gathering of delegates, but the financial depression kept many at home. Many of the sections were well attended, especially the one on Operative Dentistry. The papers were interesting, but, with the exception of a paper by Dr. Emil Schreier, of Vienna, who explained his method of treating infected teeth with kalium-natrium, I did not hear anything particularly new. But there were many interesting things in the other sections. The general sessions were well attended. The clinics were unfortunate in having a crowded and stuffy room; but they were otherwise successful.

Dr. Faught requested a synopsis of the treatment advocated by Dr. Schreier.

Dr. McQuillen.—The idea of the treatment was to introduce the preparation, which, as I understand it, saponifies the putrescent pulp; and in many cases, if there is much moisture, it burns it out entirely, leaving a clean root, which is to be removed with alcohol or peroxide of hydrogen. I have tried it in three or four cases since my return, and in a few minutes have secured results that I have not been able to get before in one application,—that is, to find the root absolutely sweet after treatment. With other remedies it has taken more time; but with two or three applications of this material it seems to entirely change the condition of things. You have to be careful in applying it, for, if too large a quantity is used, it may result in an explosion. It is better to use the rubber dam and a small quantity of this agent. I think it is worth

while for every one to try this preparation. I believe there is no secret in his preparation and that the S. S. White Dental Manufacturing Company made arrangements with Dr. Schreier to furnish it.

In many cases, after extracting the pulp, Dr. Schreier has been very successful in using it where he was not sure that every part had been removed. In working it down, it would have the same result there as in a putrescent pulp. After using it, you must proceed exactly as you would with an ordinary pulp-canal. Some seemed to think that after a time it would disintegrate if it were simply put in there and allowed to stay with the idea that the pulp had been made inert.

I used it about a week ago in a lateral incisor where I found a great deal of pus, the tooth having been dead for some time. I closed it up, and have not seen the patient since, but received a note saying she was comfortable. I have never been successful in immediate root-filling in these cases. In fact, I never attempt to fill a putrescent tooth at once. With this preparation, after thoroughly cleansing the tooth, it has been sealed up for a week, making, as I think, a good test of the preparation.

The President.—In lieu of a regular paper for discussion, the subject, as announced on the programme, is, "In cases of congested pulps, should arsenical applications be made without preliminary treatment?"

Dr. Faught.—I have no facts to offer in regard to it, and never could be persuaded to do it. The principle of my practice has been to always reduce the inflammation as far as possible first, and then make the application, as I believe it to be the better practice.

Dr. Boice.—I have had some experience in making applications without preliminary treatment. About ninety per cent. are successful; the other ten per cent. make you regret that you tried the other ninety. It depends largely upon the temperament of the patient and the amount of inflammation. If a patient comes with the pulp exposed, and is going away for months, I would even then put in a partial treatment by applying morphia and leaving it in for ten minutes. Some years ago I practised immediate filling quite frequently, but do not do it now.

The President asked Dr. Boice if he had ever had any experience with Baldeck's Nerve Paste in connection with congested pulps.

Dr. Boice.—I have not. In using arsenous acid I take it for granted that it means arsenic. Any preparation that has morphia in is hardly to the question. The finer the arsenic is ground the less liable it is to cause irritation. Some of that procured at the drug-

stores is entirely unfit for use. By taking it in the fingers you can feel the grains in it. I use a porcelain slab and a steel instrument to regrind it, and do so with every application I make. The preparations upon the market are generally prepared by some secret method and are not to be relied upon. Every time I have deviated from this rule I have regretted it.

Dr. Culver.—I always endeavor to allay the inflammation before making the application.

The President asked Dr. Faught how he allayed the inflammation of the pulp.

Dr. Faught.—An idea occurred to me while the other gentlemen were speaking that is, perhaps, new to the profession. It is experimental in a measure with myself, and perhaps I should say nothing about it. My ideas have been turned in this direction for the last year and a half for many reasons. You will often find that an irritated pulp will exist in the mouth of a patient of a highly nervous organization,—a high tension pulse. I have been considering the pulse a great deal in dentistry; where you get a high tension condition the application of arsenous acid at that time only increases the difficulty, causing much trouble in allaying the inflammation with morphia, which is the remedy I apply. Even then I believe great good can be obtained if, in connection with the application of morphia, you place the patient upon the use of salicylate of soda. The use of this agent has especial reference to a high tension pulse,—to highly nervous organisms, to individuals undergoing what are characterized as sedentary occupations. If we look to the excretions of such persons we shall find that they are throwing off uric acid in varying quantities. According to the highest authorities the normal excretion is in proportion of one grain of uric acid to thirty-three grains of urea. This will perhaps vary one to eighteen, one to twenty, one to forty-two. If you place the patient upon the use of salicylate of soda it renders the condition of the urine alkaline. Uric acid is thrown off from the system when the urine is acid; therefore if you place them upon salicylate of soda you throw off that quantity held back when the urine is alkaline.

I merely make these statements as a matter of scientific inquiry. I am a strong believer that we have yet to explain some dental conditions by examination of the urine, and particularly under these irritative conditions in which the nervous system is being required to carry an added burden. In connection with the morphia application and the salicylate of soda, where the latter has been used continuously for seven days or more at a time,—not less than fifteen

grains four times a day,—the excretion of uric acid in proportion to the urea never varies, but without it it may prove an added irritant to the system.

Dr. Bonwill.—I have but one word to say to it,—Never!

The President, asking Dr. McQuillen to take the chair, said,—

"It is undoubtedly true that it is bad treatment ordinarily to apply arsenical preparations to congested pulps. An honest confession is said to be good for the soul, and I might as well make a confession.

"The hint has been thrown out by one of the speakers that they never use any secret preparations. I must confess that I do occasionally. I experiment with it, and if it works well I continue it. When I asked if he had used Baldeck's Nerve Paste I did so for the purpose of ascertaining whether the experience of others had been the same as mine in the use of that preparation. My attention was called to it about two years ago by an English dentist. It was sent to me, and not knowing its composition I hesitated to use it. One day my bottle of nerve paste had crumbled up and did not seem in proper form to apply, so I took a little of this Baldeck's paste and put it on a pellet of cotton not larger than a homœopathic pill and applied it to the pulp. The patient was suffering from pulpitis. After sealing the cavity with rosin-wax the patient was sent away, with the understanding that I should see the case within forty-eight hours. The patient came back at the appointed time and stated that no pain had been suffered. I applied it time after time in the same way without knowing its preparation or its ingredients. I have used it now for two years successfully with one single exception. I have applied it indiscriminately to all cases of congested pulps and healthy pulps wherever obliged to devitalize.

"That is my confession. What it is I do not know. It may be arsenic, but I don't believe it could be anything worse than arsenic. If it is strychnine or cyanide of potassium it would not be worse than arsenic, and I do not know that I care what it is so long as it devitalizes the pulp and does no mischief."

Dr. Deane.—I do not understand Dr. Boice when he says he applies arsenic alone to the pulps, the arsenic of itself being too much of an irritant. In my practice I combine as much morphia in the cavity as I possibly can with the arsenic paste. The more there is of morphia applied to such a pulp the easier it is for the patient. I would never think of applying the pure arsenic.

Dr. Faught.—In a personal experience with Dr. Boice I never thought the doctor used any acid, as he only used the probe and inserted it into the cavity. I believe that Dr. Boice, in making the

application, used such a microscopical quantity that it made his practice successful.

Dr. Boice.—The inflammation should be so under control that cold water can be injected in the tooth and the patient will not object to it, and with a probe so fine that you could put it through the cuticle without knowing it. I place it in the pulp with arsenic attached to the end. It is not the case, as Dr. Deane seemed to infer, that I apply before I get it into condition. I do not apply the arsenic until I can prick into the pulp with a probe before I use it.

Dr. McQuillen.—How do you get the tooth in that comfortable condition?

Dr. Boice.—By the use of sulphate of morphia.

Dr. McQuillen.—So that it is not responsive to heat or cold?

Dr. Boice.—Yes.

Dr. Faught.—I have experienced that at Dr. Boice's hands.

This closed the discussion of the subject.

INCIDENTS OF PRACTICE.

Incidents of practice being next in order, the President stated that the Chairman of the Executive Committee suggested that a meeting be held some time to recount failures as well as successes, and suggested that such might be done at the present time.

Dr. McQuillen.—I would follow the suggestion in describing an application made to a pulp about the 5th of July. The patient came back after a proper time. In August there was still life in the tooth-pulp. She was in the office yesterday, and the fourth application was made to it, and the pulp was still quite as sensitive as it was early in July. I applied absolutely pure arsenous acid, without any morphia or anything else. There is no pain, but it is a very sensitive pulp when touched.

Dr. Long stated that nodular pulps would sometimes behave in that way; but Dr. McQuillen, in reply, said he could find no indication of any such thing.

Dr. Darby, the President, then took the floor, and said,—

"I have brought here to-night some new preparations of plastic filling-material. This was a subject that occupied a good deal of attention and elicited considerable interest at Chicago in one of the sections. I have been using for some time preparations new to me, and have brought them here, thinking they would be of interest. I speak of Poulson's cement, and one called Plombe Granite, and a cement that Dr. Tiburtius-Hirschfeld brought to me some time ago, prepared by Carl Worff, of Berlin. She says it is

most used and best liked in Germany. In my hands none of the phosphate-of-zinc formulæ have ever given the satisfaction that Poulson's cement does. Most of the German cements have phosphoric acid in a crystalline form, so that you are obliged to work it before melting it. Dr. Hirschfeld told me she had discarded all in which the phosphoric acid was in solution, preferring every time the crystals or that in crystalline form. The German cements do not harden as quickly as our American cements. In proportion as there is a small percentage of water in the phosphoric solution or crystals they harden slowly; and just in proportion as they harden slowly they become durable and lasting; and as they harden quickly, in my experience, they are ephemeral in their duration; so that I have come to the conclusion that those that require the greatest amount of work in preparing them produce the best results.

"In the mouth it takes Poulson's cement from ten to fifteen minutes to harden. It should be protected with wax, or what is still better, rosin and wax. I melt it on a spatula, and pour it on the filling after it has stood from two to five minutes. It scales after a time, but does not crumble off as wax or paraffine. I have no faith in paraffine,—it scales off as soon as it becomes wet. If you let them harden under wax and rosin for a day or so, they take a finish almost like polished ivory."

The doctor then proceeded to mix the three different preparations, and made three pellets for inspection and for the purpose of showing his mode of mixing the ingredients, using a piece of platinum, shaped into a disk about the size of a ten-cent piece, upon which, over an alcohol lamp, the substances to be melted were placed.

"The Granite cement is more granular, yet, at the same time, makes a good filling. It was sent to me by Dr. Davenport, of Paris.

"The preparations can be obtained of Dr. Poulson, of Hamburg, and cost about the same as here.

"For crown-work I use Ash & Sons' cement. It sets slowly and remains in a plastic condition for a long time."

In answer to a question as to what was a fair length of time for such fillings to last, the doctor said that he thought a filling lasting two or three years without renewing would be a good one.

Dr. Bonwill being called upon, prefaced his remarks by asking Dr. Darby how long he had used the preparation he had exhibited. Dr. Darby replied that he had used it years ago, and had laid it aside because he didn't like its action; that it was only during the last few months he had begun to use it again, and he was now more willing to take the trouble required.

Dr. Bonwill then continued, saying, "Men won't take the

trouble. I cannot answer for Poulson's cement. I have been using Weston's for four or five years, but I do not like it as well as at first because I do not believe Weston manipulates it any longer; still I get good results by working it more carefully and having a certain temperature, and, everything being ready, placing it in as quickly as possible. My friend Dr. Darby will not take the trouble. By using Weston's poorer cement and being more careful in putting it in and capping it, and not only capping it, but soaking it in, he will get good results. I do not want it to stick to the surface. There is where Dr. Darby makes a mistake in placing paraffine on the surface of the filling. It should be soaked into it. I can contour cases that I never before attempted except with such material as gold, etc.

Dr. Faught.—I cannot allow so much to be said in favor of Weston's cement without saying that I consider it the most abominable cement on the market. I did not believe it possible for Dr. Bonwill, under the most favorable circumstances, to make it so that it will stand the tests of Poulson's cement.

Dr. Darby.—The pellets I made during the evening will be very hard in twenty-four hours, especially the Granite and Worff's, but the Poulson cement is reasonably hard already.

Dr. McQuillen.—There is a cement on the market to which attention has been called in the last few months, known as Richter's Harvard cement. With the exception of Poulson's, I consider it the best I have ever handled. The phosphoric acid is in a liquid form very much like glycerin, and the powder is fine and particularly well ground.

Dr. Boice.—The old Weston's cement was very sandy, and in mixing it it had a dirty color, but it would wear very well. The present cement is one of the poorest we have. I have tried to use it, but was obliged to give it up. I went to the gentleman who had charge of making it and asked him to mix some, which he proceeded to do, and in two or three minutes it was very hard, but in twenty minutes it was softer. I thought the fault might have been mine, but when the person who prepared it could not make it work satisfactorily I concluded it was the fault of the materials. Poulson's cement I have tried and given up, but will try it again.

The subject was passed, and the President urged all to attend and bring others. A paper on Hypnotism was spoken of as one of the probable future subjects.

Dr. Bonwill suggested that some time the members relate their experiences in Chicago, as to what they saw new and what not new in dentistry.

Adjourned.

THE regular monthly meeting of the Odontological Society of Pennsylvania was held at 1228 Walnut Street, Philadelphia, on the evening of October 14, the President, Dr. E. T. Darby, in the chair.

After the transaction of routine business the President introduced the essayist of the evening, Dr. Kirk, who read a paper on "Lime Formations in the Pulp-Chamber."

LIME FORMATIONS IN THE PULP-CHAMBER.

BY EDWARD C. KIRK, D.D.S., PHILADELPHIA.

LIFE has been defined by Mr. Spencer as "the continuous adjustment of internal relations to external relations," which formula is intended to apply to life in its normal or physiological expression. Aberrations from this standard are what we understand as pathological conditions, and constitute disease. This Ziegler states is a deviation of some of the vital manifestations from the normal: the deviation being conditioned by external influences. It is from the stand-point of this conception of the equilibrium of the vital forces in relation to their environment which would seem to best enable us to understand the particular deviation from the normal health of the dental pulp which we are to consider this evening.

The dental pulp functionally considered is the formative sensitive organ of the dentinal structure of the tooth. It is developed in the early weeks of intra-uterine life from the subepithelial connective tissue of the fœtal jaw as the dentinal papilla. This structure in its earlier stages is histologically homogeneous in character, but as development progresses there is formed upon its periphery, about or near the fourth month, a layer of columnar cells, the odontoblasts, which constitute the so-called *membrana eboris*. It is this layer of cells which is immediately concerned in the production of dentine. The deeper portion of the pulp, consisting of embryonal connective-tissue cells, develops a net-work of fibrous connective tissue, with its characteristic bundles of fibres and spindle cells, through which pass the blood-vessels and nerve fibrillæ, and these together constitute the normal tooth-pulp.

The odontoblasts are a modified or specialized form of the connective cells from which they originated. They send out fibrils or rod-like processes towards the enamel, and around these processes is deposited the calcific material giving to the dentine its characteristic tubular structure. The calcific material in question has been called, by Professor Harting, of Utrecht, calcoglobulin. The process

of dentine calcification takes place from the periphery towards the centre; hence the area of the pulp becomes gradually diminished through increasing age, during which time the fibrillæ of the odontoblasts elongate, while the cells themselves undergo little or no diminution, simply receding before the advance of the progressing calcification.

It is perhaps not possible to state with precision at what period the process of calcification is normally completed. It has been demonstrated, however, that after a point has been reached where the functional activity of the odontoblasts has naturally ceased, they, having apparently accomplished their normal limit of work, have been again excited through some source of irritation, either local or systemic, to renewed activity, whereby their function has been reawakened and a new deposit of pathological dentine has been thus formed, which is described as secondary dentine. The location, structure, and extent of this secondary dentine formation are no doubt determined by the nature of the irritant which has acted as the exciter. For example, the stimulation may be so localized as to include but a limited area of the membrana eboris, so that the odontoblasts of only that territory will be excited to the deposition of calcoglobulin, while the balance of the pulp will not be affected.

Many instances of this localized formation of secondary dentine are met with in dental practice, and their exciting cause is usually easily ascertained. Thus, in the progress of caries, where the process is so slow that the pulp is not overstimulated through the irritation to the dentinal fibrillæ, we frequently find a deposit of secondary dentine upon that portion of the wall of the pulp-chamber which is being directly approached by the carious process. In fact, as Miller has beautifully shown in his work, "The Micro-Organisms of the Human Mouth," the merest break in the enamel covering is immediately taken cognizance of by the pulp, so that the zone of dentine traversed by the irritated fibrillæ undergoes a certain modification in its structure, which, though not clearly made out as to its character, is still sufficiently marked to constitute a change in texture and refractive properties easily visible under the microscope. When the carious process has proceeded until the pulp is nearly approached, we frequently find a large deposit of secondary dentine which seems to be erected as a barrier to the progress of the carious action. Indeed where the progress of caries has not been sufficiently rapid to overtake the building-up process by the pulp, it is not unusual to find the whole pulp-chamber filled solidly with a deposit of this character.

Sources of irritation other than caries may and do bring about this same deposit. The irritation from thermal changes through metallic fillings frequently induces a local deposit of secondary dentine. Mechanical irritation at the cervical borders of teeth by the abrasive action of brush and powder too vigorously used, ill-fitting clasps upon artificial dentures, erosion of the buccal and labial surfaces of teeth, the mechanical abrasion of their grinding surfaces by attrition of the teeth and their wearing down by mastication, all tend to produce the same condition.

It is necessary at this point to distinguish between certain varieties of calcific changes which take place in the pulp. So far we have concerned ourselves only with those deposits which may in the light of our present knowledge be attributed to excessive functional activity of the odontoblastic layer of the pulp; these are true dentine neoplasms and are always found to be in direct organic union with the walls of the pulp-chamber. Microscopic examinations of these secondary deposits of dentine prove them to be true secretions of the odontoblasts with their fibrillar elements, though often distorted and irregular, directly continuous with those of the normal dentine upon which the secondary deposit is superimposed. But in addition to the secondary deposit just considered, concretions of calcoglobulin are found free in the pulp tissue having no connection with the walls of the pulp-chamber. These concrements present an endless variety in size, shape, number, and histological structure. We find very small, more or less globular nodules, others larger and more irregular in outline, seemingly an aggregation of a number of smaller globular elements united in a mulberry mass, still larger and more irregular masses without any definitely describable shape, or we may find in the same pulp-specimen a variety of masses of many sizes, the whole pulp-tissue being infiltrated with small sandy concrements. Finally, we find nodular growths attached to the walls of the pulp-chamber by a constricted pedicle of the same material. These latter are regarded by Professor Black as true pathological tumors of dentine produced through some perverted action of a localized collection of odontoblasts, and he calls them for that reason odontomes.

The etiology of the formation of free nodular concrements in the pulp tissue is involved in obscurity. While recent investigations have thrown much light upon the structure and histological character of these formations, and a reasonably copious literature has resulted, still it is difficult to find lines of agreement among investigators when the question of the etiology of these formations

is at issue. The older writers generally regarded the free calcific growths in the pulp tissue as products of the odontoblastic layer on the hypothesis that they were first developed as secondary dentine in contact with the wall of the pulp-chamber by a pedunculated attachment which was later absorbed, thus setting free the globular end of the growth in the pulp tissue. This view has been definitely proved to be an error. Later researches, notably those of Iszlai, Weil, Hamer, Witzel, Miller, Baume, Black, Bödecker, and many others, have shown that nodular concrements arise in connection with the bundles of fibres and spindle-shaped cells of the connective tissue of the pulp-growth independently of the odontoblasts.

The exact nature of this calcific degeneration of the connective tissue of the pulp is not clearly made out, and it is the various and conflicting views entertained with regard to it that give rise to the confusion respecting the character of these formations as well as to the great variety of names by which they are known. In America they are commonly called "pulp-stones." They have received the names "odontomes," "denticles," "pulp-nodules," "odontheles," etc. One author (Schlenker) has classified them under no less than six different names. The name "odonthele," proposed by Iszlai at the Tenth International Medical Congress at Berlin, is fairly satisfactory; but should, as Miller suggests, be more accurately limited by a prefix which would distinguish these internal pulp formations from the enamel tubercles occurring on the outside of the tooth. The term "endodontheles" would meet the condition more nearly.

The differences in the histological structure of these formations, as seen by different observers, has been largely responsible for the confused state of our knowledge concerning their origin. It is not that the calcific change of connective tissue presents any especially remarkable features, but the resulting product is so variable in its microscopic appearances that it becomes difficult to relate it to the normal processes which result in the formation of the other hard tissues of the body. Thus, nodules will be found presenting a structure closely resembling dentine, while others will be more like bone or cement in character; hence arise conflicting theories as to the method of their formation.

The weight of evidence, so far as the writer from a very imperfect knowledge of the subject may be allowed to judge, seems to show that these formations are the result of certain stimuli local or systemic, perhaps both, whereby the connective tissue of the pulp

undergoes a calcific organization characterized by the deposit of calcoglobulin throughout its mass, and that this deposit takes place in relation to the spindle cells of the connective tissue of the pulp in much the same manner as dentine is formed in connection with the odontoblasts. It has not been shown, so far as I have been able to ascertain, whether the spindle cell itself becomes calcified, as it is said to occur in the case of the ameloblast in the formation of enamel, or whether the calcoglobulin is excreted and formed around the fibrillar prolongations of the spindle cells as calco-spherites, which gradually grow by accretion of new material and eventually coalesce with similar formations to form large masses. Hamer, of Utrecht, has shown that the calcification follows the course of the fibres in the bundles of connective-tissue elements; that these latter become embedded in the new formation, giving to it its striated or tubulated appearance, resembling dentine to some extent; as the growth increases small capillary vessels and nerve filaments become included in the mass, which remain as open spaces in the texture of the formation, giving it its relationship in appearance to bone, vaso-dentine, and cement substance.

It will be remembered that the different cellular elements of the pulp tissue had a common origin in the homogeneous cellular structure of the dentinal papilla. The differentiation of these elements is not great morphologically, and it is not unreasonable to suppose that they should present a functional resemblance when they are affected by an irritant which disturbs the vital equilibrium sufficiently to turn the balance towards the pathological side. Over-stimulation of function results in paralysis; the harmonious adaptation of internal relations to external relations has been destroyed, and normal life is no longer possible. In the case of pulp-calcification it does not mean its immediate destruction, for the process may continue over a long period of time; but, given the continuance of the irritation, the result is inevitable, for the pulp-chamber becomes filled with a solid mass and its function is destroyed.

But little is known of the systemic causes which lead to pulp calcification. It is believed that plethoric individuals are more likely to be subject to it than are those of anæmic habit. This view seems probable, inasmuch as the nutritional vigor of such individuals is over-active, and any cause which tends to an increased vascular supply to the pulp favors its calcific degeneration. Of this we have good clinical evidence. So far as age is concerned no class of teeth appears to be exempt. Nodules have been found in non-carious as well as in carious teeth. I observed them in a

large number of cases in the first permanent molars of children at the Institution for the Deaf and Dumb in this city some years ago, associated, however, with a pronounced effort at arrestation of the carious process throughout the denture, a result which I have attributed to the greatly improved sanitary and hygienic conditions provided by the institution in comparison with the former condition of the children, which in connection with an abundance of wholesome food had markedly raised the nutritional standard in these cases and, among other expressions, stimulated the pulp to increased functional activity.

The diagnosis of calcific degeneration is extremely difficult where no exposure is present. The most reliable means known to me is the application of cold during the paroxysm of pain supposed to have its origin in this disorder, pain, more or less severe, paroxysmal, and neuralgic in character, being the only well-defined symptom.

The treatment is devitalization and filling of the root-canal. The devitalization of a pulp under those circumstances, as is well known, is a matter often of considerable difficulty. Such pulps show a resistance to the action of arsenous acid which is as persistent as it is remarkable. It can generally be accomplished by repeated trials, but where time is an object it is often preferable to administer a general anæsthetic and remove the contents of the pulp chamber by direct operation. Or the operation may be accomplished under the methyl or ethyl chloride spray. The resistance to the action of arsenic is probably due not to excessive vigor of the pulp, but rather to its diminished vitality with corresponding loss of power to absorb the drug through its altered and diminished vascular system.

The mechanical obstacles presented by nodular concrements in the pulp-chamber are often a great source of difficulty in operating for the removal of a pulp so affected. It can nearly always be accomplished by care and patience with suitable drills and canal reamers.

I have in what I have said merely attempted to outline some of the features of this peculiar condition. There are many interesting phases of it which I trust may have suggested themselves to your minds, and which will be brought out in the further discussion of the subject to-night.

DISCUSSION.

Dr. Truman.—The essayist has covered the subject so thoroughly that there is little more to be said upon the question. We are all familiar with the elementary teaching that a certain amount of

calcific matter is to be found in pulps. This takes upon itself various forms. As he has very truly said, the irritation, the result of caries or from other causes, produces similar developments along the walls of the pulp-canal, but these are necessarily normal in their characteristics. The odontoblasts originate dentine, and this is very readily differentiated from other formations under the microscope. The calco-globulin deposited in the pulp evidently comes from the pulp itself without any agency of the odontoblastic layer. How this deposit is formed I cannot answer, and I fail to find any clear reply in the books. Further scientific investigation will be required to explain the subject. It takes different forms. It is found at times to be developed as part of the pulp, and at others will be separate from it and forcing the tissue apart.

Now, all these deposits in the pulp produce irritation, and I therefore take exception to the conclusions of Dr. Kirk, that the reason why arsenic does not operate where odontomes are present is because there is degeneration of the pulp. Exactly the opposite view seems to me to be the true one,—that it is because of the increased irritation in the pulp occasioned by the deposits. All pulps of this character give evidence of great vitality in the organism.

Pulp-stones, or odontomes, are not found in persons of anæmic condition or low vitality, but exist in strong and vigorous organizations. It follows, therefore, that the pulp will share in this increased vitality. The law applies here, that in proportion to the amount of irritation will be the extent of absorption of arsenic, consequently there will always be found difficulty in the destruction of a pulp in a hyperæmic condition. Hence in pulpitis the irritation must be reduced in order to produce any effect except an increase of inflammation by the use of this escharotic.

There is another point, a small one to be sure, in his paper that I must take exception to, and that is in regard to the grooves that are produced by the tooth-brush. I cannot believe the tooth-brush ever produces grooves in the teeth. The calcification of the teeth generally extends the subject somewhat in another and yet important direction. It is well known that histologists for years have been disputing in regard to the effect of caries in producing what Tomes calls the transparent zone, and to which Dr. Kirk has alluded. The tooth he removed from that elderly patient was nearly transparent, and a very fair example of this condition. Where there is a tendency to calcification of the tubes and the intertubular tissue, it will progress, in my opinion, until nearly the entire body of the dentine is calcified, and will present under a microscope a

perfectly transparent appearance. This is not necessarily confined to the old, but will frequently be observed in comparatively young persons. I have examined the teeth of a patient thirty-five years of age where the teeth were evidently being lost through over-density, and the observation by the microscope gave the same characteristics as senile teeth. Now, the theory of Wedl, that this is caused by fat globules, cannot, I feel, be sustained. To my mind it is simply increased deposition in the tubule from constant but slight irritation. The law as I formulate it is, slight irritation produces increased development, violent irritation produces destruction. The odontoblastic cell-layer is stimulated to increased activity by the slight irritation of caries, and irregular dentine is the result, and increased vitality means additional deposits in the tubes of calcific material, and also in the pulp. When we look at this matter in its entirety it becomes very interesting, but if our observations are limited to pulp-stones, we cannot, as I view it, clearly understand the subject in its various relations.

Dr. Christensen.—I have often met these formations in practice and have seen them frequently in Germany, probably because the teeth are neglected more there and that caries generally progresses farther before it is attended to. I think pulp-stones are rarely the cause of pain in the teeth. It would be of some value scientifically to find out the cause of their formation, and some writers have attempted to explain their origin, but with no satisfactory result.

Dr. Jack.—I have a word to say that is induced by the remark of Dr. Truman's, that in cases of odontomes there is probably some irritation of the pulp. I have two cases in illustration of that point occurring in the same mouth, which would seem to indicate that this is the case. Probably twenty years or more ago a laundry-woman came to me suffering with a great deal of pain in the left side of the face. I could not clearly determine the cause of the pain, as the teeth were sound. I was obliged in my ignorance, after making some slight application to that side of the mouth, to send her away, and asked her to come again if she had a recurrence of the pain. In a few days she returned, complaining in the same manner. I examined the teeth more carefully, and found some evidence of irritation of the pulp of the first molar. I extracted the tooth, which gave complete relief. I found upon opening the tooth that the pulp-chamber was quite filled with odontomes. Not long afterwards this woman returned, complaining of the other side of the mouth in the same manner. I sent her away, wondering whether it would recur, and at the close of a hard day's work she

returned again. I extracted the tooth and found it in the same condition. Owing to the unusual exercise while at work, more blood was sent to the head, which was probably the cause of the pain occurring at those times.

I will instance another case in which there was considerable increase of what appeared to be the vital or resisting power of the pulp, where the pulp-chamber was completely filled with a calcific deposit. The pulp had been capped for a good many years until irritation set in, and I found it necessary to devitalize it. The attempt at devitalization was an absolute failure. No means I could use would enable the pulp to take up sufficient arsenic to bring about its death. I used all means at my command to bring about such relief of the irritation as to make the arsenic at all acceptable to the pulp. Failing in this, I was obliged on account of the continuation of the pain to order its extraction. The tooth was broken in extracting below the bifurcation of the roots, and the pain still continued in the distal root in consequence of the presence of pulp-tissue there, and although I did not complete the observation of the root, the probabilities are that the nodular deposit continued throughout the whole of that pulp-canal.

Dr. Kirk.—I have been turning over in my mind the point raised by Dr. Truman in relation to the failure of the pulp to absorb arsenic,—a pulp undergoing this calcific change. I have not thought particularly on the subject, though it appears to me that it is because the pulp is undergoing a process of degeneration that the arsenic is not absorbed, its vascular supply being more and more cut off and obliterated by the deposit of the calcific material. I would like to have Dr. Brubaker's views, as he is an authority on the matter.

Dr. Brubaker.—I have not given the subject sufficient consideration to speak upon it.

Dr. Kirk.—Dr. Hamer finds evidences of hyaline deterioration of the coats of the vessels themselves where the pulp is undergoing the degenerative process. Now, if the tissue is histologically affected in that way, I do not see why it was not also functionally affected. That is the point I wish to bring out.

Dr. Jack.—The pertinent question here arises as to how arsenic acts upon the pulp in devitalizing it. As I understand the subject it is not usually by absorption and chemical combination with the elements of the pulp, but by the frequently expressed but not clearly explained hypothesis that the death is brought about by paralyzation of the nervous tissue of the organ. In some instances

the pulp appears to be devitalized, and if its removal cannot then be effected it will be found on a subsequent date sensitive to contact.

In the instances where pulps resist the arsenical application there generally is evidence of hyperæsthesia of the nervous elements of this organ, and only this condition appears to account for the frequent occurrence of resistance to the expected action of arsenic. This circumstance would appear to support the theory that the obtunding repression of arsenic often is by mere paralyzation, as has been designated. A probably better term would be shock of the tissue.

Dr. Peirce.—I regret not hearing all the paper read, but I fully sympathize with the writer where he spoke of the constitutional condition, which is a marked feature in the calcification of the pulp and the formation of nodules, and also the statement, which has a great deal of force, though often overlooked, and that is, the harmony that should exist between the inherent and external forces present in all tissues. Calcification occurs usually later in life, though in exceptional cases it occurs as early as thirty or thirty-five years, but generally at later periods. This tendency to an excess of lime in the system not only causes solidification of the teeth, but also the osseous structure; in this constitutional tendency to the deposition of lime we have the pulp sympathizing with other tissues. As to why it should or should not develop there as well as elsewhere, and what conditions facilitate its development, I cannot answer. My experience is that decay, either superficial or deep-seated, has an influence in stimulating pulp calcification. In cases of teeth lost by pyorrhœa alveolaris we not only invariably find the tubuli consolidated, but the pulp-chamber also almost obliterated. So there we have constitutional conditions which favor calcification of the pulp, solidification of the tubuli, and the general induration of the tooth structure. Earlier in life, when we have superficial caries, the dentine having lost its enamel covering, the pulp has been stimulated, and from that irritability of the pulp we assume at once there has been an excess of nutritive material sent to that organ, and from this excess of material we have the deposition of lime, so that when the tooth is extracted and made into sections we find the dentine thickened, and assume that there has been an irritation from the loss of the enamel, and with this a manifest recuperative power. I call it the recuperative power because it is in this way protecting itself from exposure.

As to the absorption of arsenic by the pulp, every dentist considers it useless to make an application to an exposed pulp where the patient has been suffering acute pain from it for some hours; it

does not have the desired effect. Some astringent is first applied so as to restrict the circulation at that point. My experience has been that as the pulp was inflamed there was an exudation from it, and during that exudation there was no absorption, everything being expelled rather than absorbed, hence the arsenic had but little effect, acting simply as a caustic on the part with which it came in contact. If a little tannin be applied to the pulp, or carbolic acid and morphia, and allowed to remain from twenty-four to forty-eight hours, and then the arsenous paste applied, better results can be secured.

As one advances in years the pulp-chamber grows smaller and the pulp grows less in size. May there not be constitutional conditions where the waste is so great that the pulp-chamber may be increased in size by the waste? I call to mind the case of a patient, thirty-five years old, who was suffering from acute neuralgia radiating from the upper central incisors, in which there had been superficial cavities for ten years. The pain was constant, except when the patient was taking large doses of quinine, which gave temporary relief. Finally, the two superficial fillings were taken out, and both pulps were found to be exposed, and the pulp-chamber was almost double its natural size, induced, I take it, by a systemic condition, because waste was greater than supply. During this period absorption of the walls of the pulp-chamber was evident until the small gold fillings had come in contact with the pulp. After the devitalization and removal of these pulps and the filling of the latter the patient was relieved from the neuralgic disturbance. Here was deficiency of nutrition, while in other cases we have excess. In reference to the influence of the tooth-brush, I have noticed cases where grooves had been cut in the teeth on one side of the mouth only, which was explained by the patient brushing more vigorously on the side affected than the other. In a case noticed, both bicuspids had decided grooves cut in them just above the line of the enamel where the gums had been brushed off and then the cementum cut away, while on the right side, where there was less force used, they were not cut away at all.

Dr. Truman.—How does the brush do this?

Dr. Peirce.—Simply by the friction of the brush and powder or dentifrice. I am satisfied that by constant use it can make an impression upon the cementum of the tooth.

Dr. Truman.—Why should it make it in grooves?

Dr. Peirce.—Because the brush is thrown around the mouth in that horizonal position.

Dr. Faught.—I believe Dr. Truman said he did not know why

we have calco-globulin deposit. Will the doctor tell why, "Of course, it takes various forms"?

Dr. Truman said he was not prepared to answer that question. He had been in hopes that this discussion would have thrown some light upon it, but he had not discovered that we had reach satisfactory conclusions.

Dr. Jack.—To give some explanation as to the manner in which the brush may cut the necks of the teeth, I would endeavor to give a mechanical reason by putting two pieces of card-board together. Now, if the friction of the brush were to extend over a perfectly plain surface, it is readily seen that the friction would be distributed over the whole surface, but the form of the enamel is such that it terminates not even by an acute angle towards the cementum, but it terminates by a parabolic curve at that point. We find this at the line of the junction between the enamel and cementum. If powder be used and the teeth are not very hard, it is plain to see how we have a mechanical explanation at once for the rapid cutting away of the teeth at that point.

Dr. Truman.—My explanation of these grooves would be simply this: that the brush has nothing to do with it, or at least, if it have any influence, it is indirect. At the margin of the gum there is always a pocket formed in which deposits of secretions of the mouth are found, and just in proportion as you have these pockets you have the development of pathogenic germs and fermentation and acid products. These necessarily destroy the surface; therefore it does not require a brush to explain the groove, it being simply erosion produced by acid action, aided by the impress of the lips and cheek.

Dr. Jack.—I agree with Dr. Truman that in most instances his diagnosis is the correct one, but in some cases I consider it to be the result of abrasion.

Dr. Kirk.—I consider the specimen which I presented as being in evidence, and I do not see how it would be possible for altered secretions to have caused the loss of the tooth-structure fully three-eighths of an inch in extent. An examination of the specimen will prove the point. It has been rubbed for the past seventy years, and it had had time to be worn down.

Dr. McQuillen.—I would offer a case in evidence, where, after directing the patient how to brush the teeth, the trouble had ceased. If it had been erosion the pain would have been more acute.

Dr. Deane.—This brings to my mind a patient I had who, as she was growing older, thought her teeth were growing dark. She

thought that if silver soap would brighten silver it would also brighten the teeth, and when she came to me I found the teeth cut away very badly from the use of this soap. I stopped that, and think the teeth are no worse off now than when she came to me.

Dr. Thomas.—The discussion upon pulp-stones from a scientific stand-point has taken a very wide range as to its cause and effect and its treatment; but there is one thing in regard to this I have failed to hear, and that is, how to detect pulp-stones in apparently sound teeth and healthy patients. We frequently have patients who are suffering from neuralgic pains and with no sign whatever in the mouth from which you can detect the cause. They will probably point to a tooth which may feel tender, but the only thing you can do is to send them away until there is some irritation that will respond to tapping of the tooth. I believe that pulp-stones are far more common than the profession think. I have been led to consider the question, How can pulp-stones be detected, and what is the cause of the trouble? It has been to me a very confounding thing. You cannot advise the extraction of a tooth if you can find nothing about it to give trouble; but there is one thing I have used in my practice to satisfy my own mind, and that is, if you will take the finger-nail and scratch, producing a vibrating sensation, it will produce pain in the tooth, or use an excavator to scratch with, and if there be irritation by pulp-stones it will respond to the vibration produced on the outside of the tooth.

I only mention it because I have heard nothing said as to the means of discovering pulp-stones.

Dr. Darby.—I had hoped that the paper which has been read would elicit discussion in the line of the causes which produce pulp-nodules. Undoubtedy it is the result of irritation, but just why irritation should sometimes produce calcification of pulp-tissue and at other times death I am unable to say. Whether the same causes which produce hypercementosis upon the roots of teeth, would produce calcific deposits within the pulp-chamber I am also unable to determine.

There have been periods in my practice when I have met with a large number of cases of pulp-nodules, they seeming to follow each other in rapid succession, and then again I would not meet with one for years. I recall one very interesting case which came under my observation some years ago. It was in the mouth of a lady perhaps thirty years of age. A first superior molar had been the seat of much pain. The tooth had but one filling, and that a small gold one, upon the masticating surface. It had been in-

serted in childhood. There was nothing about the tooth to indicate that it was the seat of the severe pain which the patient complained of, and yet there was nothing else in the mouth more suspicious. Auxious to ascertain the condition of the cavity beneath the filling, it was removed, and the cavity found to be shallow. Gutta-percha was substituted for gold, but the pain continued, and a drill was made to approach the pulp-chamber, when arsenic was applied. After two or more fruitless efforts to thus devitalize the pulp, I determined to anæsthetize my patient and open the pulp-chamber, which I did, and found it completely filled with pulp-nodules.

Dr. Kirk.—I rise to corroborate the statement of Dr. Peirce, made some time ago before this Society, as to the enlargement of the pulp-chamber. I was present at the meeting when Dr. Peirce made that statement, fully five or six years ago. I told it to a number of histologists, and they hooted at it, but I still believed in it, because it seemed to me reasonable, and because of my faith in the accuracy of Dr. Peirce as an observer. In a recent paper by Dr. Caush, of Brighton, England, he treats of the morphological changes which take place and the conditions which Dr. Peirce described.

Dr. Gaskill.—I would mention the case of a young man whom I treated about two years ago, which illustrates the absorptive power of the pulp. There was a small pink spot on the face of the central incisor, but no cavity, or pain to indicate irritation. I saw the case frequently, and in about six weeks after the first visit he expressed himself to the effect that the bottom had broken out of the tooth. On examination it was found that the palatine wall had crushed in completely from mastication. After taking out the small laminæ of enamel which still remained, I found that absorption had gone on exposing the pulp; the canal and apical foramen were also quite large. On the labial side of the pulp-chamber absorption had advanced so far as to allow me to see the outline of an instrument through the enamel.

Dr. McQuillen.—I think all deep-seated cavities in vital teeth should be lined before inserting metallic fillings; if that were done there would be less trouble from calcific deposits in the teeth.

Dr. Faught called attention to the fact that Miller's preparation, for application to pulp-canals where it was found impossible to remove all the pulp, could be obtained at Watt's drug store, Broad above Chestnut Street.

The meeting then closed, and the members partook of the refreshments provided.

THE regular monthly meeting of this Society was held at 1228 Walnut Street, Philadelphia, November 11, 1893, the President, Dr. E. T. Darby, in the chair.

The essayist of the evening, Dr. Bonwill, not having arrived at the conclusion of routine business, the President suggested that subject No. 10 of the series of questions be taken up,—"The Etiology of Pus Formation,"—and called on Dr. Truman to open the discussion.

DISCUSSION.

Dr. Truman.—The etiology of pus formation is by no means a settled question. The Waller-Conheim theory of the emigration of the white corpuscles of the blood is met by the school of Virchow, Von Recklinghausen, Stricker, etc., with the older theory, enunciated by the first named,—that of the retrograde metamorphosis of tissue,—and while the opinion of histologists leans towards the emigration theory, there is sufficient evidence to support the assertion that the origin of pus may be based on both processes.

The more recent and perhaps quite as important subject in this connection is the effect of pathogenic germs in the production of pus. It has been asserted that the formation of this is impossible without their active co-operation. To demonstrate their presence in all centres of suppuration has been found surrounded with difficulty; in fact, there is ample evidence to prove that abscesses occur in which no germs are present.

It has been demonstrated by Miller and others that the air is not a very serious source of infection; and that it is not probable that micro-organisms reach the focus of inflammation through that medium in any considerable quantity. If this be true, it seems to leave but two sources of infection, direct contact with septic matter and through the circulation. While the possibility of centres of inflammation being produced through the blood needs no substantiation, it is equally true to say that all suppuration has not its origin from this source, or that abscesses are always produced through the blood. The results described by Peyrot, Kartoulis, and Laveran, in abscess of the liver, showing the absolute sterility of pus, indicates that at least the living organism is not always necessary in pus production. This is in a measure confirmed by Steinhaus, that ptomaines are "capable of producing suppuration without living organism." Janowski, Lemaire, Rosenbach, Grawitz and De Bary, and others have shown that chemical irritants will produce suppuration without the aid of micro-organisms. While this is

disputed by others, their assertions, founded on experimental researches, have not been disproved.

It is probable that at the later stages of pus formation micro-organisms become active factors in its production. The minute lakes of pus found in pulps in a state of inflammation—pulpitis—must have their origin in immigration of the leucocytes, and cannot, I think, be ascribed to any retrograde process. To what extent this may be considered as the action of pyogenic germs has yet to be determined.

Dr. Brubaker.—In the formation of pus, the first element, apparently, has been overlooked. The formation of pus is, of course, simply one of the stages of inflammation, and inflammation is invariably preceded by a state of congestion, by which is meant a condition of paralysis of the walls of the smaller blood-vessels. As soon as there is this impaired circulation there is an aggregation of the white blood-corpuscles along the walls and the emigration into the surrounding tissue. With the cessation of the blood-flow there is at once an impairment in the nutrition of these tissues which leads to a lessening of their vitality. This is the first step, and which has been alluded to as retrograde change in the tissue-cells. The mere emigration of the white blood-corpuscles through the cells of the blood-vessels, carrying with them various germs, would not in themselves give rise to the formation of pus. Germs in and of themselves cannot produce pus until there is impaired vitality of the tissues, which allows them to disintegrate the tissue molecules. Therefore I don't see how it is possible for pus to be formed anywhere in the body, except on the surface, unless you have the two factors, impaired vitality and presence of the germ. How the germ gets in the subcutaneous tissue to produce pus is, of course, a question, but I think they are absorbed by the white blood-corpuscles and are carried by them to the tissues, because they are constantly migrating.

At this point Dr. Bonwill arrived and read his paper on hypnotism.

HYPNOTISM, ANIMAL MAGNETISM, AND PERSONAL MAGNETISM AS APPLIED TO DENTISTRY.

BY W. G. A. BONWILL, D.D.S.

Mr. President,—What do I know about hypnotism, you might well ask?

Does any one know anything definite as to the truth of it; or, if

genuine, who can explain how it is done, or can it be reduced to a science to be depended upon?

The object of this paper is to show that hypnotism plays only a small percentage as an obtunder of pain; that hypnotism is due to a certain condition of the subject and not to the power of the one operating; that there are various means to produce temporary effects favorable as helps; that in analgesia we have a condition of suspension of the voluntary so far as to increase sense of touch and sound, and yet to completely annul pain, and that it can be produced in many ways; that it is not suggestion but strong impression made by the operator; the deaf can be influenced through their language, but it must be impressive; that it is not necessary in any case to try whether the patient is in a natural hypnotic state or that this can be induced by artifical means.

When once the operator will study his case and follow directions here given, success will come, as the will or voluntary brain can be suspended and held in abeyance. Not every man can command or govern. Some men can and not fail in anything they undertake.

As horses are managed by making them understand there is a master, so with human beings.

Its history is so well known that it is not necessary to make more than a brief allusion to it. Like all other good things, it has had a most terrific fight for its existence. Many brave men have gone down because they asserted it was a fact; many reputations have been forever blasted for advocating it. And to-day it is far from being believed by scientific men, although many have espoused its cause, and the learned societies are gradually endorsing it as a great principle, while its action is not in any way understood. For half a century a war has been waged against it, and still it lives, and it will endure.

As early as 1733, Mesmer, a German physician, first propounded the theory. It was then known as Mesmerism, animal magnetism, psychology, and personal magnetism, but now more scientifically named hypnotism, or artificial somnambulism. It was at one time called Braidism, after an English surgeon, who was the first to prosecute its phenomena scientifically. Mesmer claimed the effect was produced by the power of magnets in the hands of an expert. It was claimed that the will of the operator could control that of another by a certain animal magnetism going out of his (the operator's) body, and only a few could claim such power. It is now held that no force of any kind emanates from the operator. It is regarded by many as artificial catalepsy.

Hypnotism more fully expresses the meaning, "putting to sleep." It is also an induced somnambulism. That there is a certain percentage of persons who are susceptible to it is a fact. Why they are so no one, so far, can even surmise.

It was opposed by Christians because of its miraculous effects, they believing the day had passed for such wonders. The Catholic church held that it alone had such power. Scientific men opposed it on the ground that what could not be scientifically or philosophically explained could not be true, and because they could not see the *modus operandi* they refused it a hearing.

It is not surprising that it should have had such opposition, for it claimed much, and its effects were marvellous. I remember when I first witnessed the experiments I was quite a boy; it excited my curiosity, and struck terror to me.

In 1855 a class was formed to learn its mysteries. We each paid five dollars for the instruction, with a written pledge that we would not reveal the secret. We were allowed to practise it privately or publicly, but must hold the pledge inviolate.

That five dollars was the best investment I ever made, for it opened my eyes to what might never have been revealed to me.

While much has been taught and demonstrated, yet there remains much to be revealed to enable the majority of men to do what seemed impossible to them. Dr. Fillebrown has written for the benefit of dentists, but he does not give up the key to its action, as I conceive should be done, to enable others to practice it. He refers you to Bernheim. The common belief that only weak-minded persons were good subjects has been exploded.

It is certain that those of strong resistance or strong controlling will power cannot be good subjects. Those who have little resistive power can become good subjects. Fifty per cent. of adults are susceptible; most children can be directed; more women than men. The possession of the power has led to many abuses, and it is well to be on guard for unscrupulous men.

It is a means by which one can readily produce in the mind of the subject such a lasting impression as to injure health, or it may promote it.

The action is not, *per se*, abnormal, yet in the play upon the imagination can leave the subject a prey to the suggestion or command of the operator.

That it is the means of curing diseases both organically and functionally, when intelligently used, should be believed. Physicians who have relied solely upon medicine for therapeutic effects

should acquaint themselves with its value and no longer saturate their patients with poisonous doses that do more harm than good.

Much of the prejudice of the public would be overcome if they were properly taught that it is not so much in one person being able to hold another in subjection as that they, or a certain percentage, are liable to be controlled simply from a peculiar condition of their own body and mind.

While it takes several minutes before any change takes place to enable one to control and direct thought and action, in many cases but a very brief period will suffice. A command energetically made by one having the gift of ordering another to obey will be sufficient, and it is not necessary that it should be acted on at the instant, as the impression can be left on the mind, and in days after the command will positively be obeyed.

When we survey the subject in the phases of every day existence we find our actions are governed by influences we cannot fathom. We know we are led captive by the power of woman, and, *vice versa*, women by men. The presence of an animal will paralyze persons and make them lose all control of their judgment. We listen to an orator and are led captive not so much by his reasoning, but by his presence, his voice, his every gesture. There evidently is some force going out from one who has personal magnetism, although it may not be the same as hypnotism. While but few are born with such power, it can be cultivated and practised.

You hear of induction in electricity. It is as wonderful as hypnotism. There you see actual power manifested through the medium of the air, and it is only a mechanical force. Is it to be doubted that man possesses a power that may pass from him and affect another and force him to obey commands?

You tell a person to meet you at a certain time. The voice is the medium of communication, and the vibration is manifested as would be induction from the vibrations of a dynamo.

An hypnotic patient or subject becomes an automaton, and will run as a machine, without any power to resist. That the human mind can be dominated by an idea alone, without it coming as a command from another is often seen in cases of crime. In natural sleep the mind can become somnambulistic, and such subjects act as if they were perfectly awake and in their right mind.

Faith has done much to remove actual organic diseases. Christian Science has accomplished much in its peculiar way to rid sufferers of bodily and mental ailments through teaching self-control

and a belief in their own powers. The history of the human race gives thousands of facts as to cures from various methods, long before hypnotism or the assumed power of magnets were conceived and practised. Observe how many people wear magnetic rings upon a certain finger, positive as to their magic therapeutic effects. It matters not under what name the treatment is made, certain effects and cures are produced. The various modes of medical practice, as extreme and antipodal as possible, yet, each and all, do a work not to be gainsaid.

So much has been demonstrated through investigations upon this subject that gradually the real cause of all such phenomena has been brought to light, and it would seem that we are upon the threshold of an actuality which may dispel the darkness that veiled the hidden mysteries to men.

It was not until M. Leibault, in 1862, after continued experiments with hypnotism in the hospital at Nancy, in France, was it taken up by the better class of medical and scientific men and received extended acknowledgment. His therapeutic applications were so satisfactory that the power could be relied upon in the many and various cases he relates in his exhaustive work on "Hypnotic Suggestion." To him should be given the credit for the absolute system of treatment through this agent.

Then it is to "suggestion" alone, as he has named it, that we are to rely for our success. But you are not to understand that the merely asserting to your subject that a certain effect can and will be produced upon him will accomplish the object, for there is a condition of mind and body that your patient must already have or gain, without which suggestion will fail.

When I was taught animal magnetism, or psychology, as then known, in 1855, it led me to adopt it partially, and it was modified to suit my practice. It is one of many adjuncts in gaining the confidence of my patients and placing them more completely under my control in causing my operations to be less painful and giving wonderful assistance in making my practice more satisfactory to my patient and myself.

I found there was such a thing as personal magnetism, which has no relation to hypnotism. I am sure that some men can have such a personal force that they can control others and draw to them, and, while it can be cultivated to a considerable degree in many, it is a born quality or power by which good or evil may be done.

Some persons can be overcharged with electricity, both frictional

to the time of next visit. Do not let your maid attend to this part of your office. Nothing can take your place.

So much for the entering wedge—the *entrée* into your house and office—to have an hypnotic effect.

While your voice is the principal thing over all to bring out the result, these minor points speak volumes in silence to captivate and ensnare your subject.

Some I would have sit with their finger on the pulse for ten or fifteen minutes before I commence examination. To a thoughtful operator there are many avenues by which he can hypnotize,—electrically by induction, personal magnetism, etc. All of this and more I could give you.

Now, while I have written this essay on hypnotism, and have shown you that it is a great fact, and have attempted its solution, yet I must impress upon you to speak with decision, and never aim to discover in advance whether the subject is an hypnotic.

To one conversant with personal magnetism, the fact can be relied upon, that in the voice, look, and touch, the bulk of people can be ruled or controlled, and no hypnotism about it. By diverting the attention or mind at the instant, there is no failure where the pain is instantaneous. When extracting temporary teeth this is all I do, and before the little patient can take one long breath the tooth or teeth are removed.

There are many cases where I produce a more decided effect by playing on the imagination, by having them breathe the air through a tube, as if an anæsthetic were being given. Some minds are very susceptible to such a method. Do not fail to accept the fact that, aside from all these little subterfuges, without saying a word, while breathing I can universally affect them.

In conclusion, cultivate the sense of touch, sight, and voice to a great degree, and be always truthful, and, with sharp instruments, used with skill and great rapidity, you will not hurt them; you have in your grasp the many means by which dentistry may be robbed of all its horrors.

DISCUSSION.

Dr. Faught.—I am sure we are all very much interested in this paper which Dr. Bonwill has read, but I feel quite confident he has only entered upon the very outside of the subject of hypnotism. Thirty-four pages would hardly cover a full treatment of the subject. I am quite disappointed in that he has only gone into its primary stage, that every one who has given any thought to the subject is

familiar with. The concentration of thought in the patient, his idea of quietness and silence,—these things we find in almost every article written upon the subject.

I have written a treatment of one thought in connection with the subject, and if I clearly get you to see that one thought I shall have started you, I think, on the right road to the understanding of hypnotic influence.

The study of hypnotism, or of hypnotic suggestion, though fitfully pursued for many years, has only in the last two or three made any pretence to classification as a science. It is now being classed under the medical sciences. They, however, are positive in character, while it by nature is occult. In speaking, therefore, of such abstruse matters, there is often apparent disagreement when in reality the opinions advanced are in perfect harmony. This apparent disagreement is due to many causes, but the main reason of difference has at all times arisen from the attempt to define what in point of fact is undefinable, and is necessarily the outcome of the use of terms which are not susceptible of accurate definition. Hypnotism, being allied to spiritistic phenomena, requires that each student of it must for himself be the supreme judge of whether what is conveyed is or is not; for the principles governing the latter are involved in a primary study of the former. Everything proceeding from the invisible world has always come through human instrumentality, and has differed according to the conditions of the transmitting medium and those of the persons to whom directed. All such communications are therefore imperfect, and relative in value. Nevertheless, the unseen world is teeming with intelligences whose action upon this one is very direct, and is governed by laws, most of which are hidden from us; and those which are known are not comprehensible to the many.

With these introductory remarks and premises, I propose to confine myself to one point of study. I wish to explain to-night, if possible, how the hypnotic influence is conveyed from one person to another, apparently separated from each other. I wish to show that the separation is not as complete as appears to the observers, but that the individuals are in physical contact. For the purpose of this demonstration it is to be realized that our external senses are not tests upon which we can rely for anything, being organs for the transmission of sensations. It is an irrefutable axiom, that a thing is to the sense which perceives it what to that sense it seems to be. No one will deny that when they lay their hand upon a table or desk that there is actually no contact. What is true in

the larger field is true in the lesser. No atom of matter in the hand is in contact with another atom, for each atom of matter everywhere is surrounded by what is called its "dynasphere,"—that is, a definite invisible circle manifesting perturbations derived from the energy of the atom. What is the constitution of this dynasphere can only now be inferred to be matter in still more minute atoms, even so finely divided as to be unseen by any known means. Their influence is felt though unseen. We are accustomed to this condition in every-day life, for science admits matter exists in gases and ether, in light, and in heat; indeed, nothing has yet been discovered of which it can be asserted that no matter is there. It must, therefore, be in the atomic dynaspheres themselves, and it is evident that we can conceive of no limit to it. The dynaspheres of atoms are in their turn surrounded by dynaspheres, and so on *ad infinitum*. This dynaspheric force is the agent of the phenomena of hypnotism, spiritism, and occultism generally. This physical thing is nothing more or less than what we have been in the habit of calling "spirit" when we wished to separate it from what is termed "ordinary matter." It energizes and does work in and upon "ordinary matter," and is a separate form of matter, infinitely refined and infinitely rapid in its vibrations. This dynaspheric force it is which, passing from the organism of the operator by a continuous chain of matter in harmonious vibration, impinges upon the organism of the hypnotized patient and controls his will, his acts, and words. Here we have the secret of the attraction or repulsion we call love or hate, sympathy and antipathy, etc., which we produce upon our neighbors or they produce upon us. We but express the truth when we commonly say that we make or receive an impression. Scientifically speaking, all individuals in every-day life more or less hypnotize each other. To understand hypnotism we are therefore to clearly grasp the idea that physical, mental, moral, and emotional forces are all material. In this concept is a field of undreamt-of potency.

Professor Newbold.—I think I can hardly say anything directly relevant to the statements of the last speaker. It must be very evident to all of you that the theory which Dr. Faught has advanced involves not merely the phenomena of hypnotic suggestion, so called, but practically, we might say, the complete philosophy of life, here and hereafter as well. It seems to me also that the theory which he has advanced,—the spiritistic theory,—as an explanation of the phenomena of hypnotism, is possibly a little premature. I would not say that the facts we have are entirely incon-

sistent with it, but I would say that those who have most carefully studied hypnotism, and those who at present are best recognized as authorities, are not inclined to assume such an explanation. I don't like to use the word hypnotic force, as a force over and above the ordinarily recognized forces of physics and chemistry.

As to the points raised by Dr. Bonwill, it appears to me that the facts he presents all would be inclined to accept. It seems to me also, however, that we might differ with him very decidedly in the strong line of demarcation which he is inclined to draw between hypnotism as such and ordinary sleep and the phenomena of suggestion as distinguished from hypnotism, which he seems inclined to attribute to some personal magnetism proceeding from the operator. Without denying the existence of such magnetism, I think it is evident we must go as far as possible with the recognized facts and ordinary principles of psychology before we need to introduce any such new or hypothetical influence.

I do not deny that there are certain facts which are very well distinguished, which do indicate the necessity of assuming something analogous to thought induction, the possibility of one mind affecting another mind by some means other than the recognized forms of sense, but I think one would prefer for a long time to refrain from formulating any defined theories to account for such facts. I think, first, we need careful, competent, and trained observers; very few are either careful, competent, or trained. We need to get the facts and place them beyond dispute. At present they are disputed by men for whose opinion we must have very great regard. Consequently you might say I stand to-night in a more or less sceptical position in relation to the theories and in a cautious position in relation to facts.

Dr. Truman.—We have Dr. Warren with us this evening. He has had considerable experience with hypnotism, and I should be glad to hear from him upon the subject.

Dr. Warren.—I have been more or less familiar with the phenomena of hypnotism all my active life. My father used it to some degree in his practice of medicine many years ago. Of late years I have employed it to a limited extent in my own practice. I would say with Dr. Faught, that I am disappointed in the paper presented this evening; I came with the expectation of hearing something more advanced,—something of a scientific nature presented to a body like this. While as a guest of the Society I appreciate the courtesy of the floor, I am frank to say that the essay was so elementary that I must decline to discuss it.

I will say this, however, of hypnotism, that I believe we can use it in our practice to a remarkable degree. I believe, too, that there is a great deal in the operator himself, and there is something more in it than suggestion; in fact, from personal experience, I have more than once laid the patients or subjects upon their backs in a profound sleep without speaking a word,—a mental suggestion, if you please. In practice, when a new patient presents himself or herself, I always endeavor to reach the mind and act upon it before operating upon the teeth. I think if we would all take that time with our patients to secure their confidence and then retain it, we would meet with more success in practice and help remove the fear and dread of the dental chair.

I might speak of one case occurring recently. A child—a young girl—who had never been in a dentist's chair was brought to me. While preparing for the operation and washing my hands I found the little one was crying, and the mother trying to get her to step up into the chair herself, or endeavoring to force her to do so. I asked the mother to step into the other room and make herself comfortable and leave the child to me. In a moment or two I had the little one's confidence, and proceeded to perform the operation, which was the insertion of three fillings, without a flinch or complaint from the child, the work being thoroughly done. She told her mother that it was better than playing dolls; then seeing that the remark was rather amusing to us, she turned about and explained why she said it, which was that she was entirely at ease in the chair, and was interested in the work, but when she was playing house with the other children they had their troubles and quarrels.

That is simply one case, and shows that with a little care we can make the dental chair really comfortable.

Dr. Truman.—This subject is a profound one, and has claimed the attention of some of the best thinkers of the world.

From my earliest boyhood I have been interested in this and kindred topics, and this has not lessened as it has become a recognized subject for scientific investigation. It has, in all ages of the world's history, been the custom to repudiate unknown and startling statements, no matter however well supported, until they have received endorsement from recognized scientific bodies. Now, I believe that truth can originate from very lowly sources; in fact, I may go farther and say that the majority of truths that have eventually come to be recognized as such have had their origin in humble places, and not from the higher scientific circles of the period.

The prevailing idea that animal magnetism, mesmerism, hypnotism, for they are all synonymous terms, had their origin in the work of Frederick Anton Mesmer is an error. It was hoary with age before Mesmer was born. The other generally received opinion that Mesmer was a charlatan is equally erroneous. Those who are familiar with his history cannot truthfully denominate him as a quack. It is true he practised methods which at this day would be regarded as indefensible by correct thinkers, but in judging him the peculiar conditions of the period in which he worked must be taken into consideration, and also the fact that he really believed the modes adopted were necessary to the production of the magnetic sleep. The credit due to Mesmer, and it should be given him in full measure, was that he proved the existence of this power. The practical knowledge he possessed was doubtless received from Gassner, a priest of Switzerland, who effected cures by manipulation. Another idea in regard to Mesmer, that he was an uneducated man, is disproved by the fact that he graduated in medicine in Vienna, and for some time practised his profession.

Reichenbach fifty years ago demonstrated, after strictly scientific work continuing over five years, the existence of a force in the human organism, which he named odyle. This odylic force or emanation could be observed in sensitive subjects. He did not attempt to give any explanation as to the origin of this, but if the result of his experiments can be accepted, he proved its presence in the human subject. When Professor Newbold claims that until we have exhausted all sources of explanation we have no right to assume the existence of a force analogous to electricity, he is not, I think, standing on tenable ground. The statement assumes that there has been no evidence adduced in this direction worthy of consideration. Has he made himself familiar with all the work of the past? I have no question but this has been done thoroughly with the means at command, but there are sources of information not always within the reach of those willing to work, and until these be sounded it is perhaps proper to take a non-committal position. The entire subject of occultism, in its practical and theoretical bearings, must be cultivated to understand this question in its general relations.

Personally my experience and study of the phenomena connected with hypnotism go back a half-century. It was somewhat of a family affair, as my father, in his medical practice, made much use of it in minor surgery, as the extraction of teeth.

During all this long period the mere idea of suggestion was not

considered of vital importance. This was introduced in 1841 by James Braid, a surgeon of England, who denominated it hypnotism, or, more strictly, neuro-hypnotism, dropping the neuro subsequently. It was generally regarded as an unknown force inherent in the animal organism. Unless we accept Reichenbach's investigations, this has never been proved, but the evidence has been growing steadily through many decades that no other explanation will accord with the facts. I think the majority familiar practically with hypnotism will agree with me in the assertion that when passes are made from one individual to another, both the recipient and operator are conscious of an influence abnormal in character. I have personally felt this in marked degree traversing with electrical rapidity through the nerves, and at times producing almost local paralysis. This is not the result of suggestion. While it is true that mind can act readily on mind under proper conditions, I question its power as described by writers. I have repeatedly put persons to sleep, when in a highly nervous state, by making passes over the body and without touching the person. In one instance, in low, nervous fever, sleep was induced always by this process. This may be called suggestion; I prefer to regard it as induction of a current of unknown properties, and producing an equilibrium in the disturbed nervous force of another.

Many experiments not necessary to mention here have demonstrated the existence of a force in the animal economy not as yet recognized by science. That the needle of the compass has been moved repeatedly without contact is a well-attested fact. The most recent, and, perhaps, as well supported as any other of this class of experiments, is that of Dr. Julian Ochorowicz, with a sensitive, in Italy, in which the needle made movements, hither and thither, of fifteen degrees, by simply bringing the hand of the sensitive near, but not touching, it. The galvanometer was not in the least effected. The theory of suggestion will not explain this phenomenon. The fact that the galvanometer was not disturbed disproves the electrical theory.

These and similar experiments, extended from the time of Reichenbach, have, I think, shown at least the possibility of a force differing from any known power.

There is yet much to be discovered; indeed, the little we do know is simply the outermost fringe of the psychical problems yet waiting solution.

Professor Newbold.—I desire to say a word or two in reference to my previous remarks, which Dr. Truman has probably not under-

stood. I do not deny the existence of such a thing as any method of communication between two minds by means other than those ordinarily recognized, but I have never seen such facts as would point in that direction. I think it unfortunate to invoke any hypothesis to explain facts which can be explained by laws of phenomena which we do not understand. A very large part of the phenomena of suggestion and hypnotism, taking the two together, can be explained by perfectly well understood laws, or, if not perfectly well understood, at least prevailing principles and general laws. If there be facts which cannot be explained by well-known hypotheses, it will be time enough then to bring in others.

Dr. Gilbert.—The subject is of great interest to me, and my success in practice is due to the use of hypnotism, more especially with children, although with grown persons to a considerable extent. I have gone so far as to extract teeth without pain, the patient stating that to be the case. I now call to mind a case in which I extracted a molar where I told the patient that it would not be felt, and no pain would be incurred, and the patient said after the extraction that no pain had been suffered, although it was strongly and well fixed in the jaw.

As to the personal electricity, I find sometimes in operating that it proves very uncomfortable and annoying; so much so that the soles of my shoes would require dampening to avoid affecting the patient while undergoing treatment; they have expressed it as though a pin had been stuck into them. That, of course, was electricity.

Dr. Bonwill.—If there is any magic in hypnotism then there is magic in rapid respiration. Every one knows it to be a physiological fact that the amount of air passing into the lungs will produce an obtunding effect. I have learned it in experiments upon myself. You can destroy the sensibility to pain, but increase the sensibility to touch; experimenting on myself with chloroform led me to that discovery. I say to my patients, "Breathe rapidly; breathe as hard as you can; this will not destroy your sensibility to touch; you will see me and feel me, and it will be exaggerated."

I urge my patients to breathe very rapidly, at the same time talking to them and making suggestions. While hypnotism will affect only about forty per cent. of cases, rapid respiration will affect all. The suggestions and addresses should be in a loud and commanding tone, they must be markedly affected by a positive voice, as a general commands his army.

Dr. Faught.—I think Dr. Bonwill makes a mistake in regard to the commanding tones and loudness of speech. My idea of com-

mand is the power back of what is said, and not the way in which it is said. A command used in the most quiet tone would bring about obedience when it is known the power exists back of it to enforce it. It is not the law but the power behind the law which gives it the effect.

Dr. Warren.—I wish to endorse what Dr. Faught has just said. The suggestion need *not* be made in the form of a loud command, but on the contrary can be made in a very quiet tone. I have often sealed the eyes of subjects so that it was impossible for them to open them, simply by saying, quietly, "You cannot open them." Sometimes we will find among our subjects a nervous young girl, who, when she finds it to be impossible to open her eyes, will commence to struggle, and, if allowed, would go into hysterics; but by saying, in the same quiet manner, "Stop struggling and your eyes will come open," she will stop and the eyes open at once.

The element of danger has not been brought out this evening. I would like to say a word in regard to that. From my experience and observations I believe there is no danger whatever except what the operator ignorantly or foolishly makes of it, by giving suggestions that are dangerous. If the operator is an intelligent man or woman, always respecting the subject's feelings, there is no danger or unpleasantness whatever. In nearly all cases the subject must be entirely passive and willing; then you can control them very easily. Operators should always have special training and understand thoroughly how to handle the subjects when they are in the hypnotic state.

Dr. McQuillan proposed Dr. Theodore F. Chupein for honorary membership, and the meeting then adjourned.

THE regular monthly meeting of the Odontological Society of Pennsylvania was held December 9, 1893, at the Hall of the College of Physicians, Thirteenth and Locust Streets, Philadelphia.

The President, Dr. Darby, presided.

On motion of Dr. Kirk the general order of business was suspended.

Mr. William R. Newbold, being introduced by the President, read a paper entitled "The Psychological Aspect of Hypnosis."

THE PSYCHOLOGICAL ASPECT OF HYPNOSIS.

BY WM. ROMAINE NEWBOLD, PH.D.[1]

MR. PRESIDENT, LADIES, AND GENTLEMEN,—In responding to your invitation to present to you the psychological aspect of hypnosis I find myself confronted by sundry difficulties. The phenomena in question are exceedingly complex, and it would be impossible to give an adequate review of them in the scanty time at my disposal. In the second place, they have engaged the attention of the scientific world but a few years, and many reported phenomena cannot be regarded as incontestably established. And in the last place, there is no consensus among psychologists as to the construction that is to be placed upon them.

The theories, psychological and physiological, that have been proposed to account for hypnosis are very nearly as numerous as the theorists, and not one has met with universal acceptance. Yet we are by no means relieved of the responsibility of framing hypotheses. Scarcely ever has a great scientific generalization been established that was not constructed out of the ruins of a thousand hypotheses, and unless those thousand hypotheses had been devised, tested, and successively found wanting, we would never have had the material out of which to construct the true explanation. It is in this light that I regard the theory which I shall have the honor of putting before you to-night. It is based upon the facts of hypnosis chiefly as observed and reported by the school of Nancy, which my own limited experience has in every respect confirmed, and is most nearly akin to that of Dr. Despine. It is an effort to bring the facts of hypnosis into line with the psychological doctrine of the dynamic mental state, a doctrine which was, I believe,

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first taught clearly by Herbart, but for which a satisfactory scientific foundation has been but recently supplied by the researches of neurologists into the functions of the cerebral cortex. Scanty and disputable as our knowledge on these points is, there is a substantial agreement between the main results of introspective observation on the one hand and clinical observation and direct experiment on the other which is exceedingly encouraging.

You will readily understand that within the limits of this paper I can do no more than state and make plain the leading features of the tentative theory upon which I am now working. It is a theory that brings the chief phenomena of hypnosis into harmony with fundamental psychological principles and with the fundamental principles of cerebral physiology as far as I understand them, but which must undoubtedly suffer extensive modification as our knowledge of mind and brain progresses. I shall, however, in concluding, point out some of the dangers attending the practice of hypnotism and say a word as to the relation often supposed between hypnotism and telepathy.

It has long been known that certain individuals can be put by the use of definite agencies into a condition closely resembling sleep, but differentiated from it by sundry traits. These agencies are numerous, but all agree in involving the checking of the train of ideas, the restriction of attention to one idea or sensation, or to a constantly recurring but narrowly limited series of sensations, such as is given by passing the hands before the patient's eyes, by light touches or stroking, by rotating the head upon the shoulders, and so on. After the lapse of a time that varies in different individuals from a few seconds to thirty minutes or more, phenomena closely resembling sleep supervene. The eyelids become very heavy; they close; the field of consciousness becomes narrower and narrower, wanes, and finally disappears. When the patient awakes he believes that he has been asleep. But we can show that he has not been asleep in the ordinary sense of that word. He is nearly always cataleptic: his limbs tend to retain any position impressed upon them by the operator. He appears to be keenly alive to all that the operator says and does, but has neither eyes nor ears for any one else. This is the so-called phenomenon of *rapport*. He is frequently partially and sometimes totally analgesic. Pin-pricks and pinches are felt as touches, and burns as warmth. Sometimes, although not as often, he presents hyperæsthesia of sundry senses. He can read fine type at a considerable distance, can hear sounds that he cannot hear in the normal state, or can distinguish the compass points

when very near together. But the most marked and most constant symptom is his absolute obedience to the word and wish of the operator. If told that he cannot open his eyes, cannot bend his arm, he cannot. If told to open his eyes, he opens them; if told that an elephant, a ghost, or anything else you please is before him, he sees it; and similar hallucinations can be produced in all the other senses. Negative hallucinations can also be produced. The operator can by a word destroy sight, hearing, touch, and other sensations, or can make the patient blind to one object or person, deaf to one sound or the voice of one person. Nor is it necessary that the suggestion be executed while the patient is in this abnormal condition. It may be executed hours, weeks, or even months afterwards. Sometimes the patient passes spontaneously while executing it into the condition in which he was while it was given, and he is then usually not aware that he has done it. Sometimes he does not so relapse, but executes it in his normal state, and then he will often devise all manner of plausible pretexts for his action,—anything, indeed, will he allege except the true reason, and that he rarely suspects. Finally, and this is a most characteristic symptom, no matter how deeply he appears to sleep, he can nearly always be awakened by a word. If I leave the patient undisturbed for a time while thus apparently asleep, all these phenomena usually disappear. He is no longer cataleptic, analgesic, hyperæsthetic, or suggestible; he is no longer *en rapport* with the operator, can no longer be awakened by the simple command; in other words, he is truly asleep in the ordinary sense of that word. Sometimes, however, if left to himself, he will awaken spontaneously, and no evil effects follow. He may feel a slight drowsiness, lassitude, or chilliness, such as we often feel when awakened from a nap, but nothing of a more serious nature need be feared.

I have described to you the hypnotic state in its most marked form,—that which is known as deep sleep, or lethargy. About twenty per cent. of all normal and healthy adults, if we accept the conservative estimate of Dr. Moll, can be put into this condition. Of the other eighty-odd per cent., about twenty or twenty-five per cent. are not at all or but little affected by the agencies which I have described. A slight drowsiness and weight in the eyelids they will probably feel, but not more. The remaining fifty-five or sixty per cent. are affected in various ways and to various degrees. Hardly will any two individuals present exactly the same phenomena, and scarcely any two writers agree upon the degrees

that are to be recognized. Dessoir recognizes two, Charcot three, Forel three,—but his three do not coincide with those of Charcot, —Liébeault six, Chambard six, Bernheim nine, etc. Of these, the two proposed by Dessoir seem to me worthy of note. In the first grade only the power of originating voluntary movements is affected. Consciousness remains undisturbed, but the voluntary muscles are more or less withdrawn from voluntary control. The smaller and more highly specialized groups, such as those controlling eyes, lips, tongue, and fingers, are the first to be affected, then the larger groups. Suggestions affecting these muscles will then be executed, but hallucinations cannot be produced, nor will post-hypnotic suggestions be executed. In the second grade both the sensory and motor systems are affected and are subject to the suggestions of the operator. This is usually found in lethargy, but frequently without it. In the first grade only the functions connected with the efferent nerves are affected, in the second those connected with the afferent as well.

It is agreed by all observers that the most characteristic trait of hypnosis is the heightening of suggestibility. To this, catalepsy, automaton-like obedience, and the production of hallucinations can be reduced. Spontaneous analgesia and hyperæsthesia cannot be reduced to suggestibility unless the operator has carelessly dropped some remark in the presence of the patient indicating what he expects to find; yet in explaining suggestibility we shall, I think, find the clue to the explanation of these phenomena also.

Suggestibility is found in all normal individuals. Volumes have been written in illustration of the fact that the mere lodging of an idea in a man's mind is of itself a certain momentum tending to affect his action. It may take root and grow, or it may seem to have fallen upon barren soil and produce no effect. The world-wide phenomena of unconscious imitation, the influence which we unconsciously receive from our surroundings and exert upon one another, the curious epidemic manias of the Middle Ages, the periodic epidemics of crime, of which we have recently had several, all these are illustrations of the fact that the suggested idea is a momentum that has its own weight, which may indeed be overpowered, but which must always be taken into consideration. Now, in all degrees of hypnosis and in many conditions not classed as hypnotic the force of the individual idea is greatly exaggerated. In the most extreme cases it is no longer one of many momenta: it is the controlling power which seems to fatally determine what the man shall do, and even what he shall see and

hear. Of such a man we say that his suggestibility has been heightened.

The explanation, therefore, of hypnosis, from the point of view of the psychologist, turns chiefly upon the explanation of suggestibility, and upon that we must for the present concentrate our attention. If suggestibility is characteristic of the normal man, its explanation must be found in the fundamental laws of mind and brain. We must then determine what conditions limit suggestibility in the normal state, and in what way we may remove these conditions and heighten it.

I must now ask your indulgence for a few minutes as I leave the problem of hypnotism proper and endeavor to sketch the main outlines of a psychological theory or method which we find to-day very wide-spread among neurologists, and rapidly gaining ground among those psychologists who bring to their proper work some acquaintance with physiology and pathology. According to this view all mental states are accompanied and conditioned by physical processes in the cerebral cortex. Upon this there is substantial agreement, and it may be regarded as the fundamental postulate of physiological psychology. Its converse, that every cortical process is accompanied by a mental state, is still disputed. If we admit this fundamental postulate, we are compelled to admit its corollary also,—that all the laws that govern mental states must admit of expression in physiological terms. And this corollary is fully borne out by the facts, as far as we are able to observe them. We must, then, learn to look upon the mental state precisely as we look upon all physical things. Scientific research in the physical world resolves itself into an inquiry into the causes and effects of phenomena, and the case is not otherwise in the mental world. The mental state must have its causes and its effects as certainly as the processes with which it is connected must have their causes and their effects. Its causes and effects need not form clearly distinguishable portions of the warp and woof of our conscious life. They may lie in the dim region that we call subconscious; but they exist, and, if our knowledge were exact, we could reason to them deductively with infallible certainty. Now, when we examine our mental states narrowly, we find that even in all the complexity of consciousness we can frequently trace out their causes and effects. Let us examine a few of these cases.

Every mental state is susceptible of development. Its dimmest and least developed form is that of the nascent idea just emerging into consciousness. Its most developed form is found in the vivid

sensation which is qualitatively like that idea. This intensity is primarily determined by the intensity of the central or centripetal stimulus by which the corresponding cortical process is awakened; but it also depends upon the cerebral constitution of the individual and upon sundry other conditions.

Mental states have effects. Their ideational effects have long been known to psychologists, and studied under the name of association of ideas. I need do no more than allude to this most common phenomenon of subjective life. They have also motor effects. The relation of the vaso-motor system to the mental state is no new discovery. The blush of embarrassment, the pallor of fear, fainting at the sight of blood, are trite illustrations. Recent investigations have shown, however, that the connection between mental states and the distribution of the blood-supply is of the most thoroughgoing nature imaginable. Mental states also affect the voluntary muscles directly. To Alexander Bain belongs the honor, I believe, of having first established the relation of the motor idea to the production of the movement which it represents. The effect exerted by mental states upon the secretions of the skin, upon the salivary, mammary, and other glands, is a matter of daily observation; but their effect upon the processes of nutrition and repair is by no means as common or as universally admitted. Yet it seems to me that we have sufficient experimental as well as clinical evidence to warrant our admitting the existence of such effects, although we do not as yet understand the nervous mechanism by which they are produced or the conditions under which they operate.

Not only have mental states positive, they have also negative, effects. These negative effects are generally grouped under the term "inhibition." They are exceedingly obscure. The development of any mental state seems to affect unfavorably the development of simultaneously nascent but independent states,—a phenomenon commonly treated by psychologists under the title "passive attention." Individual sensory states sometimes seem to arrest one another directly, perhaps by a species of interference. Motor states can certainly check one another. Into these and kindred questions I shall not at present enter. I have, I hope, said enough to illustrate the fundamental law of which I speak,—that mental states, representing to us cortical processes of whose precise character we are wholly ignorant, must be regarded as belonging to the orderly system of nature quite as much as those cortical processes with which they are connected, and that we are entirely justified in ascribing to them those dynamic characteristics, those causes and

effects which we ascribe to all physical phenomena. And into those characteristics, causes, and effects it is the business of the psychologist to inquire.

It is evident that in an inquiry into the causes of any such state or process we must go over very much the same ground as we have gone over in dealing with its effects. It may be caused *ab intra* by the operation of such antecedent states and processes as I have just described, or it may be caused *ab extra* by some sense perception. In general we term all states originated from without "suggestions," and all originated from within "auto-suggestions." Of all the agencies by which I can originate an idea in the mind of another none is as certain and as definite as language. Hence we commonly think of the suggested idea as having been suggested by words; but this is only accidental, not essential.

We have now completed our rapid survey of the dynamic mental state regarded as representing to us a cortical process. But it is evident that I have been presenting to you rather rare phenomena as illustrations of what I conceive to be one of the most fundamental laws of consciousness, and you may justly ask why this law, if it be ever operative, has so long escaped attention. The answer is not far to seek. If only our mental states existed singly, and each were free to develop itself and work out its own results without prejudice to or from other states, there would be little difficulty in determining what those results are. But in all normal states of consciousness the nascent mental state or cortical process finds itself in the midst of countless other subnascent, nascent, or definitely developed states, which it must modify, and by which it must suffer modification in countless and infinitely complex ways. It is, therefore, very difficult in the normal state to isolate any state sufficiently to distinguish its results from those of others.

Moreover, there exists in consciousness an activity of which the would-be scientific psychologist, anxious to bring all mental phenomena under mechanical or dynamic laws, usually says as little as he may. And certainly at our present stage of knowledge it is impossible to analyze it into any component factors or to determine the laws of its operation. Yet we cannot well ignore it, since it is the most constant and most powerful single factor of conscious life. This is what we call the consciousness of self. Sometimes it appears to be latent, and the man reacts upon the stimuli presented to him with almost fatal certainty. But then, again, it appears, and forthwith introduces into the train of ideas and movements an element of capriciousness that was not there before. When it

is thus present and exerts its influence over our actions we are said to act voluntarily. The character of this conscious self is largely determined by hereditary influences. But it is also genetically related to the permanent factor in past experience, and may even be described as a function of that permanent factor, since any extensive changes in the latter are sooner or later followed by changes in the consciousness of self. We are, I think, justified in believing that in this at present mysterious inner activity we see the present conscious representative of the net aggregate result of our own past experience, and to some extent that of our ancestors, confronted with and acting upon the nascent mental state.

We are now in position to form a more clear conception of what is meant by suggestibility and to point out the chief factors that normally limit it. When we say that suggestibility is characteristic of all men, we mean that any mental state tends to develop to a certain degree and to produce certain definite results. This tendency is not, as a rule, very noticeable for two reasons: in the first place, any given mental state is but one of many, and we can rarely separate its results from those of others; and in the second, it is always exposed to modification by the most powerful and least understood element of consciousness,—the self. I have also tried in passing to indicate those physiological conceptions to which this psychological theory is most nearly related, and, if there be any truth in them, it is evident that the condition which we find in the normal man implies an inconceivably complex inter-correlation and functional co-ordination between the several portions of the cortex and between the organized systems of processes which we must conceive as existing within it.

Under what conditions, then, does suggestibility become heightened? Heightened suggestibility is found occasionally as a spontaneous phenomenon. Pierre Janet has, for example, a patient who is as suggestible in the waking state as most persons are in hypnosis. She has never been hypnotized. It is sometimes found as one of the effects of certain drugs, among which are alcohol, ether, morphia, and chloroform. More light is much needed upon this question. Many dreams are due to the suggestions given by strong stimuli, which penetrate to the brain and arouse smouldering cortical processes, which pursue their devious way unhampered by the restraints of waking life, hence the frequently grotesque and unreal character of dreams. It is sometimes possible to cause a person to pass from normal sleep into a condition of heightened suggestibility that cannot be distinguished from hypnosis. An analogous state fre-

quently occurs spontaneously, and is known as somnambulism. But of all the means of heightening suggestibility with which we are acquainted, none is as easy of application and certain in its effects as the concentration of attention and limitation of the conscious field; and those effects are, as far as the subject can describe them, precisely what our study of normal conditions has led us to postulate as the chief requisite to the production of heightened suggestibility. Sometimes the entire field of consciousness appears to fade away. Then we may suppose that the only things in consciousness are the isolated ideas which the operator suggests. In others the definite heterogeneity of normal life gives place to a dreamy state in which the vivid active self seems to have retired from the field. In others the self-consciousness remains, but finds itself so weakened that the commands of the operator appeal to it with irresistible power. This enfeeblement or destruction of the self is the most characteristic phenomenon of hypnosis, and is the chief reason for the heightened suggestibility. The nascent mental state finds the chief obstacle to its independent development removed, and we can study that development and its effects under new conditions.

We must not, however, assume that the development and effects of the mental state in hypnosis are what they are in normal life, or what they would be in normal life were we able to remove other influences without in any way modifying the intrinsic character of the state which we wish to study. The checking or stilling of self-consciousness is the most characteristic change of hypnosis, but it is by no means the only change; and the other changes which are found in different subjects are so numerous that it is impossible to describe them. One of the most common symptoms is what may be described as a species of mental inertia. An idea which in the normal state would awaken a mass of associated ideas, and thus give birth to a long train of ideas, will fall dead and inert in the hypnotized mind; it seems to have spent its energy in getting to existence. But occasionally the exact contrary is observed. A mere hint from the operator lodging in the sensitive brain of the subject will be spontaneously developed into a tragedy or comedy, as the case may be, and be acted out with a vivacity and power of which the normal individual would be incapable. In these and other personal peculiarities, such as the spontaneous analgesia and hyperæsthesia which I have mentioned, we may recognize variations in the distribution of cerebral activity of whose exact character we cannot form even a conception, and which doubtless rest

upon organic and dynamic peculiarities in the cerebral constitution of the individual.

What cortical modification are we to conceive of as taking place in hypnosis? This is a question that is more easily asked than answered. I think we may say with some confidence that the normal cortical co-ordination of waking life is profoundly modified. This is indicated by the inhibition of the activity of the conscious self and the spontaneous alterations in sensation. But if we ask further just what portions of the cortex are chiefly concerned in this modification, it seems to me impossible even to propose a theory. We do not know whether the voluntary activity of the self is definitely related to some cortical area, as the various special senses are, or whether it is related to some cortical layer as supposed by some, or whether it is related to some organized system of processes distributed through the entire cortex. And as this is the psychical activity which is most profoundly modified in hypnosis, we may suppose that those portions of the cortex which are concerned with its manifestation are those chiefly modified in hypnosis. Yet, as I have shown, we have reason to suppose that other changes take place whose exact character we do not know at all. If, however, we ask to what other changes this modification of the processes connected with the manifestation of self-consciousness are most nearly related, I think we may say with some confidence that they are most nearly related to the changes that normally take place in sleep. In normal sleep the continuous ebb and flow of molecular change that accompanies waking life slowly and irregularly comes to a stop. Some little may remain in various portions of the brain, but it is for the most part in a state of comparative quiescence. In hypnosis we have reason to think that a similar stilling of the molecular activities begins to spread throughout the brain. In some way which we cannot now explain, the fixation of attention and voluntary limitation of the conscious field inhibits the activities connected with the conscious self first. If we leave the patient to himself these activities will either reassert themselves, or else the same change will spread on throughout the brain until the patient is in a normal sleep. And in the case of some persons this is the only effect that we can produce, by the use of the agencies which induce hypnosis in others. But if we do not leave the patient alone, but give him suggestions, we find that a large portion of the brain remains sensitive, that induced mental states or cortical processes—for some authorities contend that cortical processes in the hypnotized patient are not accompanied by any kind of consciousness—work out re-

sults which cannot be obtained in the patient while in the normal state. Hence hypnosis is in a sense a normal state artificially prolonged. It would, perhaps, be too much to say, with Mr. William James of Harvard, that we all pass through the hypnotic state every night while going to sleep. It seems to me probable that the methods which we use to produce hypnosis have a specific effect in determining the order in which the cortical activities are to sink into sleep, so to speak, which is not found in normal sleep. Yet the changes which take place in hypnosis probably do not essentially differ from those of normal sleep.

The phenomena of the hysterical condition, of epilepsy, of sundry forms of insanity, and of the rare trouble known as double consciousness, present many points of similarity with hypnosis, and we shall probably not be far wrong in classing all together as being due to derangement of cortical co-ordination. Sometimes, as, for example, in some forms of epilepsy, we have reason to believe that this disturbance is itself due to gross local lesions of the cortex. In many of these mental troubles we find derangements in self-consciousness and loss of voluntary control over different sensory or motor areas, and this is not seldom connected with heightened suggestibility. These facts have led many good authorities, notably Professor Charcot and the school of Paris, to regard hypnosis as a neurosis of the hysterical order depending upon some cerebral abnormality. I can therefore scarcely conclude this paper without making mention of this view and briefly indicating the reasons which lead me to dissent from it, although I do so with the modesty of the layman.

The researches of the school of Nancy have conclusively shown that the hypnotic state can be induced in the immense majority of normal adults, and they have been unable to discover any relation between susceptibility to hypnosis and hysteria, neurasthenia, or any other recognized disease. If, then, hypnosis is a disease, we are nearly all more or less tainted with it. This conclusion is supported by Moll, Dessoir, Wetterstrand, Forel, and many others. In the second place, I think that it is a misuse of language to term a state which can be experimentally induced and ended, but which does not spontaneously occur, and which, when thus experimentally produced and ended, does not tend to unfit the patient for the duties of life, a disease. But if ever we find hypnosis occurring spontaneously, it would tend to interfere with the patient's discharging his duties as a member of society, and in that case we would be justified in regarding it as a true neurosis of the hysterical order.

I have said that hypnosis may be regarded as an artificial prolongation of an approximately normal state. But, you may ask, what is the effect upon the patient of this artificial prolongation of a normal state? If the hypnotic state involves, as I am inclined to suppose, a temporary dissociation of cortical processes normally coordinated, even though this dissociation be produced by normal agencies, may it not be that by fixing and prolonging it beyond the normal time we may in a way loosen the bonds of union between the different areas of the cortex and produce a true hysterical neurosis? The question is most pertinent, and can be answered only by reference to observed facts. Some few cases of mental disturbance have been reported from the use of hypnosis, but such cases have been so few in number that we are justified in saying that the danger of such results in the case of the healthy patient in the hands of a trained operator is practically negligible. Some slight physical discomfort, as headache, drowsiness, and lassitude, are frequently found, but can usually be removed by suggestion. Headache is a very common symptom. But the only danger which is both serious and common appears to be the production of increased susceptibility to the hypnotic state. This is a very real danger, and we must ever be on the watch against it and cease experimenting at the first suggestion of it. Most authorities believe that we can always guard against it by suggestion. We can to some degree, but I know of no facts that show that the suggestion will last as long as the increased susceptibility to hypnosis.

Apart from the physical dangers springing from the use of hypnosis, we must consider the moral. That moral dangers exist there can be no question. Already several cases have been reported in which criminal assault has been committed by the aid of hypnosis, and the French experimenters have enticed patients to commit imaginary murders and thefts, to sign promissory notes, and to bear false witness in the same way. Yet I do not feel that our present knowledge justifies much apprehension on this score. We hear much in the literature of hypnotism of the cases in which the suggestions succeed, but little of those in which they fail. And they very often fail, as I shall hope to show you to-night. A suggestion whose execution the patient would find repugnant in the waking state will often meet with great resistance and sometimes fail of execution. The influence of the operator over his patient is much greater than in waking life, but it is perhaps never absolutely complete, and if there are persons who could be induced by hypnotic suggestion to commit crimes from which they would shrink

while awake, such persons are probably exceedingly rare and their weakness is rarely suspected. One other danger remains which I must not fail to mention, and that is the danger springing from careless suggestions. I know a gentleman who thoughtlessly told his patient that the devil was after him, and had great ado to save the terrified patient from throwing himself from a sixth story window. The operator must ever remember that his every word is caught by the patient, no matter how impassive the latter may seem, and he must always be on his guard against saying anything of an exciting or terrifying character.

I have never seen any good reason for believing that there is any relation between hypnosis and telepathy. It is true that telepathic phenomena are from time to time reported as having been observed in hypnosis, but such phenomena are also reported in waking life. Most certainly the hypnotized patient is not, as a rule, sensitive to telepathic influences. But even if we admit that he sometimes is, it would not essentially modify the theory which I have outlined, and we would not be compelled to return to the theory of a force emanating from the operator and controlling the subject. We would merely be compelled to admit the possibility of a suggestion being conveyed in some way and by some means not at present understood.

In conclusion, let me say a word or two on the practical principles that should guide us in the use of hypnosis. No one should attempt it without having thoroughly studied the question, acquainted himself with the works of the great authorities, and having had some experience with an instructor. Its use should be limited to purposes of research, instruction, and therapeutics. A witness should always be present. The operator must rigidly respect the personal rights of the patient. He must have his full and intelligent consent to the experiments proposed, and must never endeavor to obtain influence over him at times or in ways other than those agreed upon. He must guard the patient effectually from any future inconvenience arising from increased susceptibility, and if he have reason to doubt his ability so to guard him, he must stop his experiments. And in the last place, and this principle includes all the others, he must ever have in mind and at heart the true welfare of his patient, and act in accordance with it.

Dr. Thomas Fillebrown, of Boston, was called upon to open the discussion.

DISCUSSION.

Dr. Fillebrown.—MR. PRESIDENT AND GENTLEMEN OF THE SOCIETY, —I understand I am expected to speak of this subject to-night in its application to dentistry, and thus give a direction to the discussion more positively towards our own specialty.

It must be evident to every one that hypnotism is a many-sided subject and that it makes all the difference in the world from which side we view it, as to the opinion formed of it, as to our expectations of what it will accomplish, and also of what it will not accomplish. I shall speak only of its sedative and obtundent effects, and in this quiet aspect stage performers, of which we have so many, would not even recognize it. A statue presents many aspects. One sees the statue of Franklin from the front, another from the back, then again another sees the side view. Now, if any one were to give a description of the front of the statue, it would give no idea of it to one who had seen only the back. Then, again, how many-sided is personal character! A delineation of the Saviour scourging the money-changers from the temple gives no conception of Christ bringing the widow's son back to life, or of his weeping over Jerusalem. Scientific subjects present the same difference of views. The law of gravitation when studied in relation to the movements of the heavenly bodies and the existence of the earth appears the beneficent power that it is, but when observed as the power that impels the destructive avalanche or sinks a town when the earthquake opens the earth, it seems the embodiment of evil; but beneficence is the rule and evil the exception. The study of medicine in overdose makes it a system of destruction and death, but studied in its proper and rational administration it becomes for "the healing of the nations." Now, we must not judge opium, ether, chloroform, or nitrous oxide by the extravagant exhibitions that may be made. We must not judge the normal effects of opium by the tale of an opium-eater; nor of ether or chloroform by the extravagant effects produced upon those habituated to their use. We properly judge anæsthetics first by their stimulating and strengthening influence, then by their anæsthetic effects and the benefit we get from them during operations. I wish to make this a practical talk, and consequently I take the practical side of it. I find that human nature is most wonderfully susceptible to suggestion in the wakeful state. The blush has been referred to, so has the pallor of fear. We also realize the wonderful effects of joy, and just the bare suggestion of these states brings them about. So with the absence of fear.

You take a little child (or a big child, as to that), and you say, "We are feeling quiet." You are assured yourself. Your own presence is suggestive of courage, and you say, "Indeed, we are not afraid," and the troubled heart is stilled at once; the child walks along with you or, it may be, goes independently at your suggestion without any fear or trembling whatever. I have seen suggestion over and over again quiet circulation where the patient was in a perfectly wakeful state, the circulation being perturbed and uneven; and just the quiet suggestion that the circulation was becoming even brought about the result.

I remember one patient I had who wanted to take an anæsthetic to have a tooth out, but would not hear to the use of hypnotism at all. She would have nothing to do with it, but was terribly perturbed, the pulse 120, and by simply suggesting to that patient that the heart was becoming still and that the pulse was growing less, within three minutes it lessened twelve beats, and in a few minutes more I had removed all her disturbance and she was entirely quiet and breathed the anæsthetic without any resistance or disturbance whatever.

In the hypnotic state this condition is increased wonderfully. The receptivity is increased. That has been described, and I need say nothing more about it. It has been my fortune, I believe, to be among the first to make it practical in its application to dentistry. You know very well that a good many years ago—about 1845—Dr. Esdaile, a surgeon in the English army, while stationed in Calcutta made a record of nearly three hundred major surgical operations under hypnotic conditions, and the patients were absolutely anæsthetic and knew nothing about it and did not suffer. Now, the Eastern nations are more susceptible to hypnotism than the people of this changing and more temperate clime, and here it cannot be depended on in any great number of cases. It is one only out of about twenty among our people that become somnambulistic. If it were to affect but one patient out of twenty it would be of no good to us. After studying the subject and putting two or three things together, one from Bernheim and one from my friend in Boston, Dr. Osgood, and one or two others, I made up my mind that the lighter forms could be made continuous and would be of use in dentistry. I learned to so use it, and found it even true, and it was a great pleasure to me and has been to a great many patients since. When I first commenced I followed Bernheim's directions and believed the fixation of gaze necessary, and directed the subject to look at my fingers or on some bright object, but later I found

it unnecessary, and recently it seems to me that formality of movement or manner is not required, and I can hypnotize them just as readily without as with it. Of the methods I will speak later on.

I will now illustrate by a few cases where suggestion, without any pretence to hypnotism, has proved effective. One was a lady that I operated for within ten days. She has been a patient for a good while, and has no sympathy whatever with hypnotism. She was willing her little boy should be hypnotized, but would not think of such a thing for herself. She was in the other day and had an inferior molar tooth that needed filling. It had been filled previously, and the filling came out because of her utter inability to have the cavity put in proper condition. It needed refilling, but was so sensitive she could not bear to have it touched with the excavator, much less with the engine bur. I commenced deliberately with her, talked to her the same as I am talking to you now. I said, "This tooth is becoming anæsthetized. This dentine is becoming less sensitive. Your fear in regard to it is going away. You will be able to let me cut this without your suffering pain, and you will not mind it." I talked to her in that way and took my engine and went to work and cut it. She did not shrink; she did not suffer. She was so amused at it that she laughed and said, "I know all about this. I know what you are saying, and I acknowledge it does not hurt me, but I cannot understand it." A case like that is wonderfully illustrative to me of the power of suggestion. I cut the cavity just as I wanted it, and she absolutely did not suffer.

Another case occurring within the last ten days was that of a woman who was boarding at an institute for nervous patients and who was nervously depleted. It has been almost impossible for her to have operations performed on her teeth because of the disturbed, restless condition and her fears. Her condition was such that the moment I attempted to do anything upon her teeth she became almost rigid, shrinking away as I touched her teeth so I could hardly get near her. Of course it was of no use to talk hypnotism to that woman. I would not have mentioned it on any account, but I did commence with the same kind of suggestion that I did with the other patient, and the result was that in four sittings averaging nearly two hours each I was able to work along steadily at the teeth and do what I desired. At the last sitting the patient became tired of the monotonous talk, and she said she wished I would not talk so much,—it made her nervous; and the minute I began after that she again straightened up, and I had hard work to finish at the last sitting. She had become thoroughly weary

and needed rest. When she comes again I can repeat the same process.

Another case is that of a little girl, much disturbed, crying, and unable to let me touch her teeth. I repeated the same process and had no difficulty whatever.

Another case is that of a patient troubled a great deal with headache. Last spring I cured her of a severe neuralgia and headache. She went out of town for the summer and was to let me know if she had any return of her troubles. After a while she wrote me that she was troubled again with headache, and I replied, saying that it would pass away as soon as she read what I had written, and she wrote saying that it was relieved so quickly after she read my note that it frightened her. That is a repetition of what has been done many times, and has nothing at all new in it.

I often now induce hypnotism by simply closing the patient's eyes, putting my hand on the forehead and bringing it down over the eyes to shield from the light, and simply say to the patient, "You are growing quiet. Your feet and limbs are growing sleepy. Your feet, your hands, your arms, your body, are growing sleepy. Your head is growing heavy and sleepy. Your eyelids are growing sleepy." I find in most cases this is all that is necessary.

You can do the same thing and do it in the same way. I notice here my worthy friend Dr. Jack. You all know what a soft, penetrating voice he has. If he talks to the patient and says, "Now keep quiet under this. You will not fear,—your fears are going away. If you will just relax yourself, as I know you will when you sit down in the chair,—if you will grow heavy in the chair and let all your limbs grow heavy, you will find this will all pass away." And when the patient is in that condition, if he will say, "The tooth is becoming anæsthetized. This dentine is becoming anæsthetized. This will not hurt you,—if it hurts you you will not mind it,—it will not shock you," the condition suggested will be sure to obtain. That creates a smile, I know, but if you will study hypnotism and its phenomena and its application to dentistry you will find many places where it will not only excite your mirth, but it will excite amazement, and you will find that to-day we do not half understand human nature. It has been remarked in the paper that this is one of the faculties of human nature which we are just beginning to recognize and understand. It makes all the difference in the world whether you make a half-hearted statement or a positive one. If you take a patient and are afraid yourself that you are not going to accomplish anything, and say, "I guess

this won't hurt, but I am afraid it will," you just excite fear enough so that it will surely hurt; but a positive statement has a positive effect on the human mind. I think myself that the hedging, as I facetiously remarked, "if it hurts you you will not mind it," is more to accommodate the operator than the subject. A great many patients say that if it does hurt it is only at the point of contact, it does not extend over the whole system, and that they feel no shock from it.

Often a suggestion will not apply to a whole cavity at a time. In such cases I anæsthetize it in sections, so to speak. I say, "This is anæsthetized. You will not feel this. I can cut it without hurting you." This will serve for a part. On reaching another sensitive point I say, "Wait a moment and this point will become anæsthetized. It is anæsthetized now. Now the pain is going away,—now I can cut it away." Thus attacking new sections and making the same suggestions, I cut clear around the cavity and complete it. I know by your looks that you are incredulous. I was until I tried it; but I say upon my credit for making honest statements, that I have seen these things over and over again so many times that I cannot resist the conclusion that it is a natural physiological effect and one that we have reason to accept. It is no chicanery and no invention. I wish to enforce upon you all the necessity of repeating these suggestions. I found that operating roused the patient from the condition, and the way I overcame it was by continual suggestion. I keep the suggestion going continually to offset the waking process.

The dangers mentioned by the essayist unquestionably exist. I also recognize that in suggestion we have the remedy which will absolutely and entirely insure against them,—indeed, a veritable "similia similibus curantur."

Bernheim testifies that "hypnotic sleep is as free from harm as is ordinary sleep, and in a long practice I have never seen any harm produced by sleep induced by the Nancy method." (At this time Bernheim had induced hypnosis over ten thousand times.)

Liébeault in thirty years' practice found no trouble whatever.

Heidenhain, of Breslau, says, "Hypnosis under the direction of medical men is harmless, and may do much good."

Drs. Moll, of Berlin, Voisin, of Paris, Tuckey, of London, with a host of others in Europe and America, express the same opinion.

In my practice of two years I have never seen a patient experience any trouble whatever. And I have not yet met any operator

who had any intelligent practical knowledge of the subject who has observed the slightest sign of danger or trouble.

The President stated that Mr. Newbold would give a demonstration of hypnotic suggestion, and after that Dr. Daland and Dr. Ottolengui, of New York, would address the Society.

Mr. Newbold, taking the stand, said, "I almost feel that I owe you an apology for offering to show you the phenomena of hypnosis. I do not doubt that many of you are better acquainted with these phenomena than I am myself, and neither need nor care to see them again. I have, moreover, such a cordial detestation of public exhibitions of hypnotism that I do not like to put myself in the position of giving one. I have, however, been pressed to show you the phenomena of which I have spoken, and have consented chiefly because I feel that this audience is actuated by a desire to understand the problems involved and not by any vulgar curiosity. I think it is also due to the two gentlemen who will permit me to hypnotize them to-night to state that I have no mysterious 'control' over them except what they give me. I hypnotize them with their full and intelligent consent, and could not do it without it."

Mr. Newbold, taking the first patient, said, "This patient is very susceptible, and he very readily goes into the state upon mere suggestion."

He then seated the patient in a chair upon the platform, passed his hands over his face, closing the eyes and talking quietly, saying "that he [the patient] could hear nothing except what he was saying to him; that he could hear nobody else; that he could not open his eyes, and that he would wake him up when he was through with him."

Having brought the first patient into the desired state, and leaving him sleeping in the chair, Mr. Newbold introduced the second patient, stating that he was a candidate for the doctor's degree at the University of Pennsylvania, and had been studying psychology; that he was a peculiarly interesting subject because he did not go into a very deep hypnotic state, but remained thoroughly conscious all the time he was asleep. "It is difficult to put him to sleep, and he is a thoroughly good witness of the phenomena of hypnotism. He belongs pretty nearly to the first class, in which the motor system is affected, while the sensory system is but slightly affected."

Seating the patient in the chair, Mr. Newbold gazed steadily at him for perhaps two minutes, swaying his (Mr. Newbold's) head

and body backward and forward and up and down, neither operator nor patient relinquishing the gaze into the other's eyes. Mr. Newbold suddenly exclaimed, "Shut your eyes!" This the patient did, Mr. Newbold stroking his face and eyelids for a few moments afterwards.

Mr. Newbold then proceeded to illustrate the production of anæsthesia and contractures by suggestion, showing incidentally that patient B was not as suggestible as patient A.

Addressing the patient, Mr. Newbold said, "You can't feel anything in the right hand." Then rapping it and asking the patient if he felt anything, the patient answered, softly, "No."

"Now," said Mr. Newbold, "you can feel;" and rapping the hand, asked if he felt anything, the patient responding, "Yes."

Mr. Newbold put the patient's hand up, and said to him, "You cannot bend it;" also placed the hands together, saying, "You can't open them;" but in both instances the patient did, in a slight degree, bend the hand and open them.

Going to patient A, Mr. Newbold put his hands together, and said, "You can't open them. Try." The patient did not open them. "Now you can open them," said Mr. Newbold, at which the hands were opened. Mr. Newbold told the patient in a number of different experiments upon the hands that he could or could not feel, and, upon questioning the patient, upon touching the hands, the response always indicated that the sense of touch was in the operator's control.

To illustrate spontaneous catalepsy, Mr. Newbold put up the patient's arm, and it remained up. He then said, "Thomas, you cannot take your arm down." After being suspended for some moments, Mr. Newbold pushed it with considerable force downward, but it still remained supported. Upon directing the patient to let the hand fall, he did so.

Mr. Newbold then gave illustrations of the production of hallucinations by suggestion. Turning to the second subject, B, he said to the patient, "Open your eyes." This the patient did. "You see that private room in the University where we meet Tuesday evenings and discuss psychology?" The patient responded, "Yes." "You see persons in the room, but there is no table. Do you see a table?" Answer: "Yes." Mr. Newbold: "But I tell you there is no table. Do you see a table?" Answer: "Yes." Mr. Newbold here called attention to the fact that he was not able to dissociate the parts of the hallucination, but only to suggest it as a whole.

Mr. Newbold next showed how negative hallucinations are pro-

duced. "Open your eyes. I am getting dim and fading away. You can see me dimly. Am I getting dimmer?" Patient: "Yes." "Tell me when I am gone. Do you see anything?" Answer: "Yes."

Mr. Newbold stated that he had sometimes succeeded in blotting out the patient's vision, but only for an instant. "The production of positive hallucinations of vision is not anything remarkable in the case of patient B. He is a good visualizer, and can see anything he wishes at any time. These hallucinations never occur spontaneously, but he can produce them voluntarily."

Mr. Newbold then showed that he could not cause negative hallucinations of hearing in the case of patient B, but could in that of patient A. Mr. Newbold said to patient B, "You are deaf in this ear and can't hear. Do you hear anything?" Putting watch to his ear. Answer: "Yes." Drawing watch away, "Hear anything?" Answer: "No." Putting watch closer, "Hear anything?" Answer: "Yes; a watch."

Going to the first patient, Mr. Newbold said, "Thomas, you can't hear anything except what I say." Mr. Newbold snapped his fingers close to his ear and knocked on the chair close to the patient's head and asked if he heard anything. The response was, "No." "Now you can hear," said Mr. Newbold, and, knocking, said, "Do you hear anything?" The response was, "Yes; a knock."

Mr. Newbold then stated that he would like to show how sensitive the hypnotized patient is to every word uttered by the operator. He raised the right arm of patient A, touched it lightly without saying anything, and waited a few moments. The arm slowly descended and the left arm very slowly rose to about the same height. Mr. Newbold explained that twice, the last time six days before, he had remarked in the presence of the patient, but to a third person, that the effect of touching first the right and then the left arm would be to cause the right to descend and the left to rise. The suggestion had proved effective on both former occasions, and at the time of the second experiment the first was found to have been forgotten. On this third occasion, however, although six days had elapsed since it had last been tried, the subject still remembered that apparently chance remark. The extreme slowness of the movement probably indicated that the suggestion was much weakened by time.

Mr. Newbold then performed an experiment with subject A, designed to show, first, that the hand anæsthetized by suggestion is not truly anæsthetic; second, that the sensations received through

it, although not felt as sensations of touch, may serve as *points de répère* upon which to construct complicated hallucinations of vision.

Going to patient A, Mr. Newbold, holding a coat between the patient's eyes and his hand, said, "When I put anything in your hand you will see it on that table over there, but you won't feel it. This hand has no feeling whatever" (putting a knife in his hand). "What do you see on the table?" "Something like a knife." Mr. Newbold held the knife in different directions in the patient's hand, and the responses from the patient were to the effect that he saw it on the table indicated accordingly as it was placed in his hand. The same experiments were made, using a watch instead of a knife.

Here Mr. Newbold woke the patients up, telling them they would feel no disagreeable sensations nor headache; that no one could put them to sleep against their wills, and that they would never go into the state accidentally.

Addressing patient A (after he had waked up), Mr. Newbold said, "Now I shall try to put you to sleep, but don't go to sleep unless you want to. Make up your mind you won't. You must try to stop me." He then tried to hypnotize A for a minute or two, but without success. With this he closed the demonstration.

Dr. Ottolengui.—Some years ago I was very much fascinated with the idea of becoming a hypnotizer. That was when I was entirely ignorant of the subject. After I really learned to hypnotize I soon abandoned it in dental practice for several reasons, not the least of which was that it did not seem professional to hypnotize one against his or her will; and I very quickly learned that it would be a disadvantage to me if it got out among my patients that I was in the habit of hypnotizing people, because of the ignorance of the community and the dread of getting into another's power.

You heard Dr. Fillebrown say that at first he used the method of concentrating the gaze upon a bright object, but he had finally abandoned that because he thought it preferable to have the eyes open. Now, while I do not absolutely hypnotize nor attempt to hypnotize, I not infrequently close the eyelids and rotate the eyeballs through the lids when presenting suggestions, because I think that is the quickest way to produce mild hypnosis. Whether true or not I don't know, but my experience seems to substantiate the theory that there are absolutely what has been called hypnogenic zones in the body, and that they very frequently lie back of the optic nerve. Now, you may ask how closing and rotating the eyeballs can have any effect; but I need only ask you to close your eyes and rub them and see if you do not get a sensation of light,

and it is that monotony of light-waves which it is claimed will produce hypnosis.

Before I leave the subject of hypnotism itself I would like to state a little of my experience with it and why I abandoned it. In the first place, I found a very small proportion of people were absolutely hypnotic under my influence, and with these few I met some very unpleasant symptoms; patients becoming difficult to control, and in an hysterical condition afterwards. Another curious thing was that patients would not always speak the truth. That is, they pretended to be hypnotic when they were not. Some patients had just enough knowledge of hypnotism to know when I was about to make an experiment upon them, and they were unwise enough to try to fool me into the belief that they were hypnotic. After studying the subject of hallucinations, of which you had a beautiful example here this evening, I formed a test of this kind which has proved quite satisfactory in exposing several persons whom I had previously supposed to be hypnotic subjects. The test is this: take a white glass bottle and suggest to the patient that it is blue; the patient admits it. The patient will admit it whether he is a fraud or honest, because if he is honest the suggestion will make him see it blue; if he is dishonest he knows you mean him to see it blue, so he says it is blue. At that point you have gained nothing. Now, on the third test I take a yellow glass and hold it before the patient's eyes. The malingerer reports that the bottle is yellow. Why? The light rays passing through the white bottle and through the yellow glass makes him see it yellow. He does not know what I am trying to get at. But if the patient is hypnotic he will report that the bottle is green, because it has been suggested to him that it is blue; therefore when the rays pass through a yellow medium it becomes green. I would suggest to a hypnotizer that this is a very pretty experiment to try.

Not only do I believe that there is no person who is not liable to suggestion, but I believe there can be no word spoken which does not carry suggestion with it, in consequence of which we should be very careful what we say to our patients. We see that in the effect a newspaper has on its readers. People who read a certain paper and no others, swear by anything they see in it. The publishers of that paper take advantage of this, especially in a political campaign. Take a Democratic paper. You say the Republicans don't read it, but the Democrat who reads it will go among his Republican friends and use its arguments. He does not realize that that is exactly why they were printed.

Dr. Fillebrown told us that Dr. Esdaile was very successful in Calcutta because the natives are very susceptible. When he tells us of his success in Boston we should certainly recognize the fact that the people of Boston are very much more susceptible than those of our own community. Their literature is impregnated with suggestion; faith-cure, mind-cure, and kindred subjects have been poured down their throats and into their brains until they are ready to believe anything at sight; consequently Dr. Fillebrown has an easier community to work upon than we have.

Cocaine was first introduced to this country through the medium of the newspapers, rather than the medical journals. We were suddenly startled by the information that the drug had been discovered; that it could be injected under the flesh and the part painlessly amputated. I very early experimented with it, and found it did not accomplish all that had been promised for it. At first I almost adopted the idea that cocaine was not a local anæsthetic at all, but I am ready to admit that it does have a therapeutic influence. I remember one day going to a clinic when a patient was shown me who had been unable to have anything done to her teeth until cocaine was administered. She had been given injections of cocaine and a tooth had been extracted without pain. Some of my friends said to me that they wanted to prove to me that cocaine was a valuable agent and that in this case suggestion would not work as well. I said I did not object to being proven in the wrong if I could learn something by it. The patient was a little girl about ten years old, with the remaining superior first molar very much decayed. She said she had had a tooth extracted under cocaine and that it did not hurt. I asked her if she was entirely satisfied that if cocaine were used she would not suffer, and she answered, yes. I told her that I did not believe in cocaine, and asked her if she would have the tooth out with cocaine so that I might see it done. She answered, "Certainly, that is what I came here for." I asked how much her dentist had given her, and she told me three injections of five minims each. I took a similar bottle to the one that had been used before, and giving the three injections, I removed the tooth with all the leisure in the world,—as though I had nothing else to do that afternoon. The child showed no distress or pain whatever. I asked her if she meant me to believe that it had not hurt her, and she replied that there had been no pain whatever. I said, "Gentlemen, that convinces me as to where cocaine stands. What I used was water." They were very much disgruntled, and one of them turned to the patient and

said, "Didn't he hurt you? He only used water." She said, "That explains why it hurt me, but I didn't like to say so before." Then they came over to me and told me what she had said. I replied, "The patient is untruthful. Her eyebrows tell the truth: they were not wrinkled a moment whilst I extracted the tooth."

We saw a very pretty experiment here to-night of automatic suggestion, the patient lowering one arm and raising the other. Now, we do not have the same susceptibility in waking patients. We cannot make them quite as obedient as that. In producing an effect by suggestion you must take your patients off their guard; least of all must they suspect that you are trying to influence them by suggestion; consequently I like to add to my suggestions something that they will believe of their own experience. For example, if a patient has a very sensitive tooth, you ask him if he has ever taken chloroform. The answer usually is, "I would like to if only my physician will allow it." I say, "I don't want to give you chloroform, but there is a peculiar thing about chloroform: if you inhale it two or three times, whilst it will not put you to sleep, it will anæsthetize your teeth." The patient says in his mind, "I know chloroform is an anæsthetic. I have no doubt it may influence sensation before it produces sleep; I have every reason to believe the dentist to be honest, because he has never deceived me." That is about what passes through the patient's thoughts. Then take a drop, or as little as you can, and hold it far enough from the patient's nose to be quite out of danger from heart-failure to the most sensitive patient. You ask the patient to tell you when a tickling sensation is felt in the feet, that being the first sign that the drug is at work. A very susceptible patient will feel the coldness coming up at the mere suggestion. Then I say, "Now I will prepare the cavity, and all you have to do is to tell me as soon as you feel any pain; there is no reason in the world why you should feel any pain." There are but few patients who cannot be affected in this way. Although it is true that you can give the patient chloroform in small doses and obtain an influence or sensation long before unconsciousness ensues, the mere suggestion of chloroform will serve in the majority of cases.

I want to tell of a case that was very curious. A patient said she was losing all her teeth because every dentist she went to sent her to some one else. I found her as troublesome as she was reputed to be. She was very hysterical. The instruments hurt her long before they touched her. I finally lost patience with her and determined that at the next attempt I would prepare the cavity.

I had no intention of using hypnotism or even suggestion. I said to her, "This is all nonsense about this tooth hurting you." As soon as she discovered I was determined she became rigid. I was alarmed for a moment and tried to resuscitate her, when it suddenly dawned upon me that she had gone into a mild form of autocatalepsy. I went to work, and after I had completed my filling I said, "It is all over," and she got up instantly. Subsequently she would pass into that cataleptic condition as soon as I closed her eyes. I mention this because she dropped into hypnosis spontaneously.

I find I am getting somewhat of a reputation for not hurting my patients, because for the last two years whenever a patient has said, "My teeth are very sensitive," I say authoritatively, "You will not be hurt; it is the rule of the office never to hurt anybody."

Dr. Judson Daland next took the floor and said,—

"I cannot resist this opportunity of expressing the pleasure I derived from listening to Professor Newbold, particularly in reference to his psychological explanation of the phenomena of hypnotism. This, I take it, is the most difficult problem ever set before man for solution. As to what he has said of the *modus operandi* by which suggestions are carried from the cortex to the periphery, I think in this line we must ultimately find the truth, and to-day we are nearer to it than ever before. The action of suggestions during the waking moments had been exemplified thoroughly by the experiments of Dr. Fillebrown. In the experience of physicians there are many cases where the patients improve as soon as they see the doctor.

"I remember one very interesting case where the patient was hypnotized for the first time. Paralysis of the right arm was suggested with the complete loss of ability to recognize pain. This experiment was readily accomplished, and the patient passed from under observation for a week. At the expiration of this time a second hypnosis was secured, and interestingly enough, the right arm again passed into paralysis and loss of sensibility to pain without suggestion. This was repeated six or seven times at intervals varying from one to three weeks.

"Some remarks have been made regarding the number of cases in a hundred that are susceptible to hypnotism. As to this point, all statistics must, of course, depend upon their classification,—certain phenomena that Bernheim would consider an evidence of hypnotism or Charcot would ignore. I think the three divisions,

lethargy, catalepsy, and somnambulism, are, perhaps, the most practical. If the patient is in one of these three states, that state I call hypnotism.

"In the United States the number of patients susceptible is not more than ten or fifteen per cent. My percentages are extremely low,—that may be because I am not a good hypnotizer,—but it is the result of observations upon fifty or seventy patients. Furthermore, results carried on in other countries have yielded better results. In France twenty or forty per cent. may be susceptible; and along with the French certainly must be classified the Spanish and Italian. I do not believe with Bernheim that ninety per cent., nor with Charcot that fifty-two per cent., of all individuals can be hypnotized.

"In reference to the mode of producing hypnotism (of which there are many), I have been rather fond of utilizing one that would separate me from the individual as far as possible. For four years I have used the revolving mirrors of Luys, which I take pleasure in showing you. It is composed of clock-work moving an upright spindle, to which is attached two strips of wood eight inches long and one inch wide, upon each side of which are placed six circular mirrors having a diameter of one inch. The bars revolve in opposite directions. The patient is instructed to look at the central portion steadily, and if susceptible, you will observe hypnotism, sleep, deep lethargy, somnambulism, within twenty minutes. This simply requires concentration of vision upon the revolving mirrors conformed with fixation of the mind upon the idea of sleep. I became interested in this apparatus because of the separation of the operator from the patient, thus eliminating completely all possibility of the influence of the operator's will or of thought transference, and the results have been very satisfactory. I also show another apparatus used by the sportsmen of Germany, which is made of two bars revolving in opposite directions, and containing pieces of various-colored glass placed at different angles. It is placed in the bright sunlight in an open field, and birds are attracted to it by the regularly recurring flashes of light, so that they are easily captured. Luys constructed his apparatus from the instrument. It is well known that animals are hypnotizable, and numerous successful experiments have been made upon chickens, crabs, etc."

Dr. Madison Taylor.—I have been waiting to hear if a certain point referred to by the lecturer should be emphasized,—viz., the dangers of too indiscriminate use of these measures. I wish to

urge that this point shall be strongly insisted upon in a discussion of this kind. The simple suggestiveness recommended here, the mere hinting to the individual to become anæsthetic, is a simple process readily demonstrable by many.

This, whether used by a properly-instructed operator or novice, may cause some possible mischief, if in no other way, by at least misunderstandings. This was brought out clearly by the lecturer, but not nearly enough in the discussion. It is often most tempting to induce a suggestive domination in a patient, but while securing this effect there may be too large a revelation of things that should remain hidden, which we have no right to discover.

Partial hypnosis offers many useful possibilities, and is frequently most useful, but entails grave responsibilities and some dangers not lightly to be ignored.

Dr. Newbold closed the discussion, reviewing the remarks of the speakers and thanking the audience for their attention.

Adjourned.

THE regular monthly meeting of the Odontological Society of Pennsylvania was held January 13, 1894, at 1228 Walnut Street, the President, Dr. E. T. Darby, in the chair.

After the transaction of routine business, Dr. S. G. Perry, of New York, read a paper entitled "The Care of the Teeth to the Fifteenth Year."

THE CARE OF THE TEETH TO THE FIFTEENTH YEAR.

BY SAFFORD G. PERRY, D.D.S., NEW YORK CITY.

A LENGTHY monograph could be written on the care of the teeth up to the fifteenth year. I shall only attempt to consider briefly some of the most important points.

Commencing between the third and fourth years, I will go over the teeth somewhat in the order of their eruption.

In the successful management of little children there is a condition that precedes wisdom and antedates experience, and that condition exists in the heart rather than the head of the operator.

The rude instrument is tempered with gentleness and made a means of mercy in the hands of one who has a deep love for little children, and an operator who has little ones of his own, and whose heart in consequence is kept warm and sympathetic, will be more likely, all other conditions being equal, to be successful in saving the temporary teeth.

In caring for the temporary teeth, the heart should be full of love; in managing the permanent ones, the head should be full of wisdom. In other words, a cold, scientific method cannot be strictly applied to the care of the temporary teeth. The selection of filling-materials and the manner of using them may not be of much importance in teeth that are to last at the most eight or nine years, but in those that are to last a lifetime, the materials selected and the manner of using them may tax to the utmost the ripest powers of the best minds in our profession. It is doubtless true that many operators look with indifference upon the temporary teeth. This probably arises from the fact that these teeth, as the name implies, are temporary, and seem of less value, and while to work upon them is not exactly a waste of time, yet it is somewhat like writing in the sand,—a short time elapses and all trace is gone!

One can forgive a grown man for sometimes feeling impatient at having to spend his time excavating and filling little cavities in

a baby's teeth, when he might be engaged in more responsible and important professional work; or when, with his experience of the world, and his knowledge of business principles, he might be at the head of some great business enterprise.

There are operators who take but little interest in children, and consider that until their permanent teeth need attention they are suitable patients for the assistant. They are annoyed by the timidity, the restlessness, the inquisitiveness of childhood, and persuade themselves that they are wise in reserving themselves for the permanent teeth. There are still other operators, and many patients who, considering the cost, and the pain to the little ones, mutually agree to reserve the labor and expense for the permanent set.

In a first-class city practice the question of expense is not, perhaps, a very important factor, but outside of the large cities it is important, and necessarily and justly must be considered in deciding upon the treatment of the temporary teeth.

In beginning with a family of children, it is well to have the little ones brought for an examination before there is much chance of work being required, so that they may go away with pleasant recollections of the operating-room. In fact, the whole training of a child with the temporary teeth should be preliminary to, and should lead up to, the proper care of the permanent teeth when they shall be erupted. A child well trained with the temporary teeth, which are not, as a rule, very sensitive, will be unconsciously well prepared to bear the harder work which will be needed in the permanent ones.

In operating for children, the first necessary condition is to get their confidence. When that is secured, the battle is more than half won. This will not be accomplished if the operator insists in all instances on doing thorough work. To excavate all cavities thoroughly, and to fill them accurately, may cause so much pain and may produce such an effect on the nervous system of the little patient, that the object sought—the salvation of the teeth—may be entirely defeated. The child, not yet old enough to be reasoned with and to exercise self-control, rebels, or, if of a patient nature and desirous of being submissive and obedient, gets into an hysterical state and makes a scene, and with the work unfinished is taken away by the parents, who declare that the teeth shall be lost rather than have their darling made so unhappy.

Instead of insisting, with the manner of a school-master, on thorough excavation, it is better to prepare the margins of the cavities with a light touch and a sharp instrument, cutting always

slowly instead of rapidly and nervously, and, when necessary, leaving much of the softened and decayed tooth in the bottom of the cavity. If the margins are well prepared, and creosote or nitrate of silver is applied to this softened dentine, and the cavity is filled with oxyphosphate, decay does not progress to any great extent under the filling. At the end of six months or a year, when the filling is considerably worn down, it can be all taken out, and the cavity can then, in most cases, be painlessly excavated and filled in such a manner and with such materials as to last, perhaps, as long as the tooth will be needed.

In excavating cavities for little children, I go as far as I can without producing a state of great excitement, but rather than abandon the teeth I fill them in this imperfectly excavated condition, and generally with the results above described.

Sometimes, however, if a child from three to five years of age is brought to me with the conditions of the mouth so destructive and the teeth so badly decayed that they cannot be saved without an immense amount of work, and by keeping at work upon them until the permanent teeth come in, making a martyr of the little tot, I deliberately advise the parents to let them go unfilled. But I do this with the understanding that not only the teeth, but the roots also, shall not be extracted. I had rather have the child's mouth filled with decayed teeth and roots, accompanied, as they sometimes are, with disturbed gums and unpleasant breath, than have them taken out, and let the first permanent molars slip forward into their places.

Some of the most perplexing cases of irregularity I have ever seen have been produced in this way. I will not say that temporary teeth in front of the temporary molars may not sometimes be extracted, but I emphatically declare that the second temporary molars should not be taken out until the first permanent molars are in place and the second bicuspids ready to come in. I have no fear that even the diseased roots of the temporary teeth, if left in, will do harm to the second set. I have never seen such harm.

It may seem like shirking one's duty to abandon a set of badly decayed temporary teeth; but nature is not altogether unkind, and decay is so gradual and so unaccompanied by extreme sensitiveness in the temporary teeth, exposure of the pulps even being so often painless, or if painful so amenable to simple treatment, that I have little hesitation in advising the deliberate abandonment of teeth that are so badly decayed that the child must be made a martyr of if the attempt be made to save them.

A child with unfilled temporary teeth can be dismissed to the sea-shore or the mountains with very little danger of having pain which cannot be controlled by some simple remedy which any mother would know how to apply. But let a child with the temporary teeth all filled go beyond the reach of the dentist, and have a pulp die or a dead tooth ulcerate, and see how pitiable and helpless the case is. It makes the heart ache to think of the helplessness of a little sufferer under such conditions, and it should make one pause to ask if dentistry, after all, is an unalloyed blessing, practised as it is by so many who are without heart or judgment.

In making examinations, and in operating on the temporary teeth, one most important fact should be kept in mind,—namely, that, if possible, no cavity should be allowed to become so large as to expose a pulp.

This should be looked after in order to avoid the danger of future abscesses, as well as to insure the natural absorption of the roots on the approach of the permanent teeth. Of course it is well known that the roots of dead teeth are not absorbed, as is the case with the living ones.

If a pulp which has not been aching becomes exposed in excavating, I promptly cap it in the manner so long since described by Dr. Jack,—filling a little saucer-shaped cap of platinum with a paste made with the oxide of zinc and carbolic acid and oil of cloves, equal parts, placing this over the exposed point, and then filling the cavity with oxyphosphate. The metal cap prevents pressure, and the paste sterilizes the exposed point and allows healing by first intention. These little caps, as you know, are made by rotating a round-faced burnisher with pressure on a piece of thin platinum, which rests against a piece of soft wood. They are then cut out with a pair of curved scissors, and kept on hand of different sizes, ready for use.

If the pulps have been long exposed and aching, then I destroy them in the usual way; but after their removal I do not undertake to fill the roots to their extremities with any solid filling-material. It is quite likely that in this respect my practice is not like that of most operators. In the first place, I do not believe in filling roots unless it can be done so perfectly as to stop all germ action; and in the second place, I do not like to put in a filling that cannot be easily taken out. I take out the pulp and its canal extensions as well as I can, and then fill the canals, and sometimes even the pulp-chamber, with cotton saturated with iodoform. Occasionally I use oxychloride of zinc instead, but I do not mix it so as to make a hard

filling, but only use a little of it entangled in the cotton so as to get its antiseptic effect.

In case of trouble, after the filling is removed from the cavity of decay, this cotton is easily pulled out of the roots, and relief usually ensues promptly. In impending trouble I have very many times passed a small bur under the gum on the buccal side into the pulp-chamber, but this is not very satisfactory if the cotton is closely packed, as vent is not secured.

In some unpromising cases I have put a piece of metal over the opening into the pulp-chamber, filled the cavity of decay, and then promptly drilled a small vent-hole from under the gum into the empty pulp-chamber.

Sometimes I have proceeded in this way, but have omitted drilling the hole, leaving that operation to be done only when needed. But in all cases where the hole is not drilled, I put into the pulp-chamber a few fluffy shreds of cotton carrying iodoform. The cotton is only used to convey the iodoform, and is so loose that if the tooth is ever drilled it does not prevent a prompt ventilation of the pulp-chamber.

In selecting a material for filling the ordinary cavities in the temporary teeth, there are several conditions that should be regarded. For instance, in cavities on the grinding-surfaces of the molars, for children who will not allow thorough excavation, I almost invariably use oxyphosphate. If the edges are fairly well prepared, this makes a filling which will usually arrest or delay the destructive action, even though considerable decayed dentine is left in the bottom of the cavity.

On the approximal surfaces I generally prefer gutta-percha for these partially prepared cavities, as it does not wash out near the gum. Sometimes, as with the permanent teeth, I use gutta-percha near the gum and oxyphosphate near the grinding-surface.

On the grinding-surfaces of the temporary teeth, if the cavities are large, the teeth of good quality, and the little patient will allow thorough excavation, I usually fill with amalgam, wiping away the surplus mercury from the surface of the filling with a little mass of well-annealed crystal gold.

If the cavity is small, so that not much surface is exposed to attrition, I fill with tin-foil. Under certain conditions I consider this the most beautiful material ever used for filling teeth. It is a constant wonder to me that the profession does not seem to appreciate its value. In searching for other materials its importance seems to have been overlooked.

Of course, I fill a great many of these large and small cavities with oxyphosphate, expecting to renew it when it has worn down.

On the approximal surfaces I am as careful about the restoration of contour as with the permanent teeth, for I consider it important that the little patient should be able to eat without the annoyance of the crowding of food against the gum. Occasionally I pack a single piece of gutta-percha into two adjoining approximal cavities, binding the two teeth together. The elasticity of the gutta-percha allows this, which would not be the case with the oxyphosphate or with amalgam. Either of the latter substances would break out from one cavity or the other, owing to the constant movement of the two teeth and the rigidity of the materials.

I quite often apply the rubber-dam to the temporary teeth, and when approximal cavities are to be filled, I find it of great value, not alone in keeping the cavities dry, but by allowing the use of different obtundents which can thus be kept off the gums. It also allows the neat use of nitrate of silver before filling. This I consider a preservative, as so well pointed out by Dr. Stebbins in the INTERNATIONAL DENTAL JOURNAL for October, 1891, though I use it somewhat differently from the manner described by him.

Long after I abandoned the Arthur system as applied to the permanent teeth, I continued its use with the temporary ones, but never except in cases where a firm point of contact could be left to hold the teeth in position and protect the gum. For many years I have abandoned all such cutting, except on the approximal surfaces of the temporary incisors, where I sometimes apply Dr. Arthur's system.

On all approximal surfaces of temporary molars I cut down, even for small cavities, from the grinding-surfaces, leaving as much as possible of the side walls standing, and then fill up flush, so that the perfect shape shall be preserved. I do not often cut in from the buccal or lingual sides, because the temporary teeth are, as a rule, very short. I take great care that no space is left into which food may crowd and be forced against the gum. Formerly, in cases presenting previous to the eruption of the first permanent molars, I often ground away the posterior surfaces of the temporary molars, leaving an abrupt shoulder at the gum, which was to hold the first permanent molar in place, but leaving its front surface free. This sometimes worked well, but not always by any means, for many times the first permanent molars would tip over against the cut surfaces and cause their decay, besides moving towards the front

of the mouth and crowding out the bicuspids, which were yet to come.

After all these years of beating around the bush in the hope of finding some easier way to escape the dangers that beset the teeth, I have settled down to the belief that in developing a denture for a growing child the safest way is to follow the plan laid down by Mother Nature when she works at her best. In doing this, I keep two distinct objects in view,—namely, the preservation of the shapes of the teeth, so that comfortable use of them is assured, and the keeping of even the roots of the temporary teeth in position, so that the first permanent molars shall be held back in their proper places until the bicuspids are ready to come in. When all resistance or obstruction is removed, there is a marked tendency of the permanent molars to drift towards the front of the mouth, a fact which may be overlooked, particularly by young operators.

Dr. Dwinelle once told me that he had seen a first permanent molar which had drifted forward until it stood tightly against the cuspid. At the time the first permanent molars are coming in, if there is no obstruction in front, they drift forward with surprising rapidity.

In filling the approximal surfaces of the temporary molars, when the grinding-surface enamel has had to be cut away, leaving large openings into the cavities, I get a quick and excellent result by the use of hand matrices, which enable one to keep the shapes of the teeth, and which save the trouble of finishing off the fillings near the gum and on the entire approximal surfaces. I exhibited these matrices before the New York Odontological Society last April. They are kept in place by a handle which is held in the left hand, and they are of great value when operations have to be made quickly for restless patients. They are of equal value applied to the permanent teeth.

In preparing these cavities on the approximal surfaces for gutta-percha, it is well to avoid as far as possible cutting away much of the plate of enamel on the grinding-surface ends of the teeth, as this is of great value in protecting the fillings from rapidly wearing away. If gutta-percha is used in small pieces, and packed somewhat as gold is, it can be inserted through rather small openings, so that much loss of this enamel is not necessary. In such cases, of course, no matrix can be used.

Before leaving the consideration of the temporary teeth, lest I may be misunderstood, I want to repeat that I advocate the imperfect preparation of cavities only in cases where the teeth are

fifteen years. Many renewals of the gutta-percha have, of course, been made in all this time, but there has not been an increase in the size of the cavities, and the teeth present a better appearance than they would if filled with gold. These fillings are in the mouths of most particular patients, who expect the very best treatment. The silk is used daily, the approximal surfaces are kept clean, and decay does not recur around these fillings. In making the renewals, only a few moments are required. A separator is applied, and space enough gained for passing a thin emery silk strip for finishing. After the filling is inserted, a piece of floss silk wet in chloroform is passed between the teeth, and the thing is done. Why should I fill these teeth with gold, when year after year shows no increase in the size of the cavities, and the patients greatly prefer to have them as they are? Of course, these are extreme cases, but they serve to show what can be done when great care is applied to this kind of treatment.

The next teeth in order are the second permanent molars. The fissures in these I treat in nearly the same manner as those of the first permanent molars.

The next after these are the bicuspids. The fissures in the crowns of these I also treat in nearly the same manner,—that is, I fill them with oxyphosphate or with tin-foil, mostly with the latter. In cutting out and preparing these fissures, as well as those in the molars, I am careful not to make large holes. I usually cut them out with extremely fine excavators, and aim to make the fillings as small as possible. If I use the engine for these, it is with only the minim burs, which are of course the smallest in the market. The engine is a savage instrument, and there is great danger, in its use, of cutting larger holes than are necessary. The teeth are priceless structures, and should be operated on with a feeling akin to reverence. This feeling is not much encouraged by the use of these modern dental saw-mills, which in steady hands may be safe enough, but which in unsteady or unwise ones may do an immense amount of mischief.

If the teeth are of good structure and the margins of the fissures hard, I fill them with gold once for all. With these teeth, as well as with the second permanent molars, we are dealing with a child older and more manageable than when the first permanent molars first required attention, and there do not exist quite the same reasons for the use of plastics.

We come now to the approximal surfaces of the bicuspids and molars. As with the corresponding surfaces of the incisors, we

have to meet a question not easily disposed of. To a certain extent, with cavities to the fifteenth year, I follow the same plan as the one I apply to the incisors. If the teeth are very soft and the cavities very little, I almost invariably open them with the separator, polish the approximal surfaces with the sand-paper, and cut out the decay and fill with gutta-percha or tin-foil, being careful to in no way injure or change the contour of the teeth. In doing this I cut in from the buccal or lingual side, or down from the grinding-border, though I avoid, if I can, going through the enamel on the grinding-surface.

If the tooth is of fair quality, and the cavity so large that the enamel on the grinding-end is already crushed in, I treat it somewhat as I do the anterior surfaces of the first permanent molars,—namely, fill promptly with gold in the best possible manner. Such cavities, when filled, would leave but little of the tooth standing in contact with its neighbor, and there would not be much danger of a renewal of decay.

The reason for adopting this course lies mainly in the fact that the grinding-surface being undermined and destroyed, there is no protection to the gutta-percha, and an attempt to follow this line of treatment would necessitate such frequent renewals that what might be gained in one way would be lost in another. Let me say here that I use the oxyphosphate very little on the approximal surfaces, and for several years, I may say, not at all without putting a layer of gutta-percha to the extent of about a quarter or a third of the cavity, next to the gum.

Let this point be noted carefully: Oxyphosphate is the most dangerous and treacherous filling that can be put in on an approximal surface, unless it is intended to be, and unless it is sure to be, for the most temporary purpose. In advocating this plan of practice pending the solidification of the teeth, if it involved the use of oxyphosphate alone, on large approximal cavities, I should be preaching a doctrine fraught with the gravest dangers. Oxyphosphate, rightly used, is one of the best materials we have, but, with copper amalgam, it is responsible for the loss of an innumerable number of pulps, owing to undetected and treacherous chemical solution and waste along the cervical borders.

The safeguard against the danger of copper amalgam is never to use a particle of it under any circumstances. The last use I made of it before I excluded it from the office entirely, was in the small fissures of the grinding-surfaces of the molars. It does well in these places, but it wastes away somewhat like the oxyphosphate,

though not so rapidly, and it discolors the teeth. I cannot imagine a fissure that cannot be as well filled with tin-foil, even if it has to be done under water. Copper amalgam has caused me so much vain regret, and so much humiliation, that I cannot think or speak well of it for any place in the mouth. In its present state of uneven and uncertain manufacture, I think it best to exclude it entirely. The safeguard against the danger of oxyphosphate lies in the use of gutta-percha along the cervical borders. This combination makes a very good filling for the approximal surfaces in young, soft teeth, or for frail, badly-decayed teeth of any age. In these approximal cavities, which have lost the enamel on the grinding-surface border, I have often used gutta-percha alone, protecting it from rapid wear by plunging into it a warmed platinum pin from an old rubber tooth, the head of which has been beaten out flat, and given a somewhat triangular shape corresponding to the outline of the grinding-surface aspect of the cavity. This stops the wear, and many times gives a good result.

A gutta-percha filling is not treacherous. It fails by wearing away on the surface, and that very deficiency brings the patient back with the fear that a filling is out. But the operator can possess his soul in peace, knowing that there is no danger to the tooth, because the wearing away of the filling brings the patient back in ample time. Had it been a filling of oxyphosphate, the patient would have been sailing on a happy summer sea, unconscious of the rocks beneath, and when brought back to the dentist by an ominous growl it would then be found that it was too late to avert all the ills that follow the exposure of the pulp.

Before I leave this interesting subject of the development of the teeth,—for that is what it is, Nature supplying the underlying force, and the dentist giving it, as the case may be, wise or unwise direction,—let me say, that in all the operations I have described or hinted at, both on the temporary and permanent teeth, I have had one fundamental idea in mind, although perhaps not before so clearly expressed, and that idea has been the *perfect preservation of their natural shapes.* From this I allow no deviation except in the case of temporary incisors, and in a few instances upon the posterior sides of the last temporary molars, but not until the first permanent molars are in place. Only with these few teeth do I admit that there is any advantage to be derived from the Arthur system.

Now, to sum up: This paper may seem to be a plea for plastics. So it is, to a certain extent, to the fifteenth year. But there is

great opportunity here for misapprehension. Please note that I do not advocate this to the same extent when applied to teeth of good quality, in mouths which are not what may be called destructive; and please notice also that I admit that it is a dangerous practice if carelessly applied. It begets an easy habit of putting off until to-morrow what might be done to-day, and with careless patients, who do not return for frequent examinations, it may result disastrously. But it contains a principle of practice of great value, and one which applies with peculiar force to the very best class of patients that can be found anywhere,—that is, patients who can always be depended on to come at stated periods of the year for careful examinations. I have never yet seen a patient so rich or so exacting that I have not, under certain conditions of the teeth, promptly applied it as I would and do for my own children.

Instead of being a careless practice, it is a most careful one, and is susceptible of conferring a great benefit on the patient, and of being a great relief to the operator. It saves pain and expense and renders the practice of dentistry bearable to both patient and operator.

Patients often remark what a difference between the gentle practice of to-day and that of the time when they were children. It was then a nightmare; it is now not a pleasure, but it is at least bearable. Some patients, before they comprehend its advantages, may think it a careless, lazy practice, and some dentists who do not look below the surface, but run on in the old groove, may consider it a makeshift; but these are enlightened days, and it has been my experience that most patients have a great deal of horse sense, and when taken into one's confidence, and told in a few frank, honest, earnest words the reasons for this practice, they readily acquiesce.

At about the fifteenth year the teeth have become so hard that the question of the use of gold must be seriously considered. After this time many of the arguments I have made vanish into thin air. Yet I must say that I carry along quite a number of people in moderate circumstances for whom I apply this practice, about as described, until far beyond the fifteenth year, and some for whom I continue it indefinitely. When second childhood approaches and the senile condition appears, it applies again with equal force,—I might almost say, with greater force in some cases. Some one has said that there is an eternal fitness in things throughout the universe. Since teeth must decay, how fitting and fortunate for humanity that we have such beautiful materials as gutta-

percha, tin-foil, and oxyphosphate! If I do not couple amalgam with these, it is not because I do not use it, or because I have not respect for it, but rather, perhaps, because I cannot take quite the same pleasure in its use. It is not one of my pets,—it is one of my necessities. I do not include gold, because that is peculiar, and stands by itself, unrivalled still when used in its proper time and place.

The work of developing a set of teeth for a growing child is the most satisfactory of any professional work of which I have any knowledge. The physician, bowed with the fearful responsibility of life or death, gropes more or less in the dark, uncertain if his medicines really kill or cure. His problem is so complex that there must always remain a doubt, and though he has all the wisdom of all the ages, his patients must finally die. The surgeon, with better opportunities for exactness, and with the inspiration that springs from the more than marvellous advances that have been made in these recent years, cannot always make his patients live. But the dentist, full of reverence for the way in which Nature works, and recognizing the hinderances that prevent the fulfilment of her perfect purpose, can, by his deft fingers and steady brain and loving heart, give such aid and direction to her efforts, that his life-work may be a perpetual blessing to those who intrust themselves to his care.

DISCUSSION.

Dr. Jarvie, New York.—This is a case in which the last shall be first, for I was the last comer, and, unfortunately, I was not in the room when Dr. Perry commenced his paper, and so did not hear all of it; but it is a most interesting question, and has been ably treated. It is a subject that does not receive the consideration it deserves. I think we should so treat the teeth of children that at middle age they will have a good, wholesome set of teeth, and to accomplish such a result requires good judgment. The paper stated that observing and directing the development of a set of teeth was, perhaps, one of the most interesting things that occurs in the dentist's professional career. That has been my experience, and, in deciding upon the management of a child's teeth in any given case, I have always had in view the condition I hoped to have them in when the patient should attain middle age.

To accomplish a desirable result, we are sometimes embarrassed by the parents, whom it is desirable to be made to understand why we use materials to fill the teeth of their children which are neces-

sarily temporary in their character, and which must be renewed from time to time, rather than to use gold, which many have an idea is the best filling-material for all teeth, and which, once inserted, ought to last forever. All teeth of young children, and those of delicate organization not young, ought almost invariably to be filled with the plastics or with tin, and such fillings must frequently be added to or replaced as circumstances demand. Gutta-percha, oxyphosphate of zinc, and tin are by far the best substances to use, yet I should be very sorry to be without one filling-material that has been severely denounced by the essayist, and that is copper amalgam. I have had one or two experiences such as Dr. Perry related, and have seen many others; but I still think copper amalgam is very valuable as one of our filling-materials.

There are certain classes of children's teeth—I mean quite young children, in which we can save the temporary molars for a few years by the use of that material—that we cannot save in any other way. I have one or two cases in mind,—a child three and a half years of age was brought to me with the worst teeth I have ever seen in a child,—one of the most healthy and vigorous-looking, yet at this age not a sound tooth. The superior incisors, all four of them, were broken off. The gums were healthy, but the teeth had become exceedingly sensitive, so much so that the child masticated food with difficulty, and the condition was becoming serious. I removed the decay in the molars as well as I could, yet imperfectly, keeping the cavities as dry as possible without the rubber dam, as I could not apply that, and saturated the surfaces with carbolic acid for a few minutes. Then I filled with copper amalgam, and it seemed to have apparently some adhesive property, for it remained where I had hardly dared expect it to.

Another case was somewhat similar,—the child five or six years of age and the temporary molars in the same condition. This last case was treated about two years ago, and I see the child frequently, and the fillings remain good, very much better than I had any idea they would when I tried it, for I used it largely as an experiment. The child, from masticating with difficulty and pain, found she could masticate with comfort, and the relief seemed marvellous to her. I am the best friend she has, and she comes to me with delight. I do not think I could have accomplished the same result with any other material than copper amalgam. I use it frequently in temporary teeth, and it serves a purpose accomplished by no other material.

I want to emphasize all that the essayist said in regard to the

use of tin-foil in the fissures of the temporary molars, but more particularly, perhaps, in the sixth-year molars. I think it is by all odds the most valuable material we have for such cases. The fissures can be readily removed, where the decay has not progressed to any great extent, and easily filled with tin-foil. I use No. 3. It works almost as plastic and is almost as readily applied as amalgam. I had the pleasure of seeing some block tin prepared by your president the other night which had a quality I had never seen before. It was soft, yet cohesive, and was in the form of shavings, and will undoubtedly prove of value.

Dr. Hall, of China.—I am fully conscious of the fact that you will attach more importance to the unique place of my residence than you will to anything I might say to you upon the subject of the paper that has been read.

Though the paper stopped at the fifteenth year and assumed the care of the teeth to that time, it seems to me that Dr. Perry has touched about every point that constitutes the perfect salvation of the temporary and permanent teeth, for, having carried the patient up to the fifteenth year with such treatment as he describes, the permanent teeth are perfectly safe. The discussion of the material that enters into the care of the teeth of young or old is, I believe, of minor importance compared with the true welfare of the patient. The wish to keep the teeth as Nature meant they should be kept is evidenced in every line of his paper. That which the artist used in mixing his colors applies most fitly to everything that the dentist does in the care of the teeth. And, whilst I am distinctly in favor of certain facts of detail and the wisdom of deciding upon certain things as facts from which we may not depart at all except in the line of experimentation, I am still willing to believe that great laxity is permissible in the choice of materials, from copper amalgam to gutta-percha, or anything else. We all know that Dr. Perry is not in the habit of presenting in his practice or before societies anything that is not of the very best. I feel very much pleased that I have been here, and I am more than flattered to think that, after an absence of more than fifteen years from the profession, I can truthfully say that I have, in a large measure, had the pleasure of agreeing with Dr. Perry in methods and most of the points that he has brought out to-night, and it gives me a great deal of satisfaction to find myself fairly in line with those who are older and banded together in this country for that which is the very best in the preservation of the teeth.

Dr. Woodward expressed himself as much pleased with the

paper, having come from New York to listen to Dr. Perry's views on this important topic.

Dr. Truman.—Dr. Perry's paper is entirely in accord with my own views in regard to this subject, and are those I have held for the last twenty or twenty-five years. Years ago, when discussing the question of the treatment of children's teeth, I felt myself practically alone when advancing the same ideas that Dr. Perry has formulated to you so thoroughly to-night.

I, however, go further than he does in this matter, for I am almost prepared to assert that it is malpractice for any individual to place gold fillings in children's teeth from eleven to sixteen years of age. I know that is a strong statement, and perhaps I should qualify it to some extent by the assertion that some teeth will bear it; but we cannot reason upon exceptional teeth. The teeth that are sufficiently dense at that age to bear such fillings are extremely few.

What is the philosophy of this? You all comprehend the fact that a tooth at this age of life is not fully developed. That all the tubuli, histologically speaking, are very much larger than they will be at a later period; and if you place a good conductor in the teeth, as gold, irritation will be produced, and the irritation upon the peripheral ends of the tubes will be carried to the pulp, producing inflammation and final destruction. If this be the case (and I cannot see that it is possible for any one to deny it, knowing the minute anatomy of the tooth-structure), are we justified in ever using gold in that class of teeth? I have, therefore, declined to use gold up to the twentieth year, except in rare cases, notwithstanding the frequent objection of parents. If parents are permitted to dictate to us, we have mistaken our calling. I have had some such difficulty, but I always say, You must accept my word in the matter or it would be better to take the child elsewhere. This I regard as the only course to pursue in these cases until greater density is secured. The expression that "whatever tooth was worth filling was worth filling with gold" has lost its force, and we are coming down to a philosophical method of treating teeth,—not alone those of children, but all teeth.

Dr. Perry seems inclined to fill the canals of deciduous teeth occasionally. I should say, never fill them. I do not see the necessity for this operation. If a proper antiseptic be used, it will be all that is required. [Dr. Perry here stated that Dr. Truman had misunderstood him, that he did not state that he filled temporary tooth roots.]

Dr. Truman explained that he so understood it and was gratified to know he was in error.

Dr. Faught.—But one idea has entered my mind while listening to this discussion to which I would like to give expression. We have heard the old story often repeated. Men of unquestioned integrity and observation tell us one thing, and men of equal integrity and observation and learning tell us another thing. The question ever is, What is accepted practice? We find out, after all, that the latitude as to how to care for the teeth to the fifteenth year is not a fixed quantity. That it is not malpractice to do certain things we have had very plainly exemplified here to-night; but it is very desirable to arrive at definite methods of treating teeth. Dentistry can never become the fixed thing it should be in the eyes of the public until that time. Here is full reason why it is so difficult to get our patients to understand that a filling once put in a tooth will not preserve that tooth forever, and the reason why we find it so hard to make parents understand why we use plastic fillings instead of gold up to a certain age. Our patients go out from us and rub against each other and find that the majority of men in dentistry are not a unit in the matter, and they get down to the conclusion that gold must be used in all cases, and they come to us with a determined effort that will make it difficult to care for these children at this age.

Dr. Jefferis.—Dr. Perry started out by giving us what we like to hear,—his own views, and not a dogmatic expression of them. If I have any difference with him it is in the use of amalgam. I use amalgam with a small percentage of copper in it,—not the copper amalgam as ordinarily understood. Also in the use of pink gutta-percha on the approximal surfaces of the temporary molars where they are decayed. In making a filling between these teeth I frequently use it, and find that it answers the purpose not only in arresting the decay, but in protecting the gum from the impaction of food between the teeth, which separate hard fillings will not do. The teeth naturally fall apart as the jaw grows to accommodate the larger second teeth, and if the space is filled between them when decayed with the pink gutta-percha, it will protect the gums while arresting decay of the teeth. And further, when the molars are devitalized, while I extract the pulp as well as may be, I place a disk over the pulp cavity and fill the cavity in crown only, in every case drilling a vent at the cervical buccal margins.

Dr. Boice.—I use gutta-percha and tin, and very little oxyphosphate; but my principal difficulty is in getting good gutta-percha.

I once made a statement at the Pennsylvania State Society that I would give a hundred dollars for an ounce of good gutta-percha. I believe I would now give a hundred dollars for an ounce of the same material.

Dr. Bonwill.—It is with pleasure I greet such practical men as the essayist, Dr. Perry. His suggestions are from honest convictions of sight. He is an enthusiast in his profession and desires our consideration, and his teachings are generally good,—very good. He is a safe operator to follow, and while we differ on some matters, yet I can say in sincerity, follow him. Think for yourself at the same time, let be said what may and from whomsoever it may come.

Dr. McQuillen.—Dr. Perry mentioned the difficulty in satisfying parents. I think we should follow our own conscience in what we do and not allow them to enter into a discussion. When I say I am going to fill a tooth with a certain thing there is no discussion. It goes in.

Dr. Bassett.—It seems to me the paper is very exhaustive. I have followed Dr. Perry's ideas closely in my own practice. In regard to the treatment of teeth by the use of plastics before the fifteenth year, I may go further and say with Dr. Truman that I consider the use of plastics, of the kind mentioned, necessary until the teeth are thoroughly solidified, in spite of the protests of parents who consider that a tooth once filled should be always filled, and that gold is the only filling to use. I must continue to use gutta-percha where I think it is of the best to preserve the teeth from decay which are below the average in quality, and withholding the use of gold and other hard materials until the teeth are thoroughly solidified.

Dr. Roberts.—I endorse Dr. Perry's statement. Copper amalgam I have no use for; it is too treacherous, and also leads to the destruction of the teeth even after the crowns are gone.

Dr. Peirce said he thought the paper was overflowing with good common sense.

Dr. Milliken.—The gentleman from Shanghai, Dr. Hall, said it was an excellent paper and covered all the points. I fully agree with him as far as the paper goes, but I do not think it has gone far enough. I think as a profession we are apt to confine ourselves to filling-materials, which I regard as a mistake. When patients come to us we should quietly take them in; not financially, but physically. We should make strict inquiries into their mode of life, especially if they be young, and as we go on from month to month,

watch to see if there is any change in their health. I think if we made a practice of it we could recognize any changes in their condition which could be corrected by calling their own or their parents' attention to it. Very few of us ever think of such a thing as inquiring how many hours a day the patient spends in the school-house, and how many hours in the open air; what they eat and drink and how many hours they sleep; whether the sleep be sweet and restful or disturbed and restless. Such things do not seem to cross our minds. As an instance of that, I had a little patient who has been in the habit of coming about every three months (a pretty, healthy-looking child). She had never been afraid of me, and I had always managed to get along nicely with her. I noticed when she came two months ago that she was nervous and fidgety, and the moment I took up my mouth mirror she nervously asked me what I was going to do. The question surprised me. I inquired if she slept well, if her appetite was good, etc.; she replied, "Yes." Upon questioning, I found that she didn't go out to play in the air much, and I sent her away and told her to tell her mother to come to see me. The mother came the next day, and I asked her if she was aware that her child was running down. She was surprised and answered, "No!" She said the child did not sleep well, but was restless and dreamed a great deal, and that her appetite had not been good for several months. I suggested that she consult her physician, and advised that the child be taken from school and sent away or kept in the open air for a month or so. She took my advice, keeping the child away from school for about a month, and it was wonderful what a change took place, not only in her mouth, but also in her general health.

I think that the best way to preserve both the temporary and permanent teeth is to preserve the general health, a plan that has not been adopted, unfortunately, in our profession. It seems to be a subject never, or very seldom, given a thought.

The President introduced Dr. Crouse, who on behalf of the Dental Protective Association solicited the members to take shares of stock in order to raise one hundred thousand dollars, with which to equip a manufactory for making dental appliances. The shares being those of an incorporated association created under the laws of the State of Illinois.

Adjourned.

At the regular monthly meeting of the Society, held February 10, 1894, President Dr. Darby in the chair, upon the conclusion of routine business, the President called on Dr. George S. Allan, of New York, the essayist of the evening.

Before reading the paper, the doctor exhibited two dental appliances, and, in exhibiting them, said,—

"What I wished to show you will be a partial failure. I had asked to have four storage batteries here, but find four gravity cells instead. It is a very compact and valuable electric mouth-lamp, and thinking it might interest you, I brought it over. The voltage supplied by these cells is not sufficient, but may give you an idea of its value. By means of this rheostat,—which is a very small one, and can be made for six or six and a half dollars,—you can regulate the current perfectly. The lamp itself would cost about three dollars and a half. When the current is on, you can, by the aid of this little lever, get a flash light in the mouth. If the lamp is broken it is easily replaced at a minimum cost.

"The other matter that I brought over is one that I showed to Dr. Kirk a year or so ago, and tried to get him to take an interest in it, but he did not do so at the time, and so I brought it over to see what the members of the Pennsylvania Society thought of it. It is a little pan for annealing gold. Oftentimes you have a surplusage of cohesive gold after finishing an operation, and it is awkward to take it up piece by piece. The pan is composed of fine wire gauze. It cuts off the gases on the principle of the Sir Humphry Davy lamp. You can regulate the heat in annealing gold without injuring it, and the gold is annealed in mass instead of piece by piece. I find it answers the purpose."

Dr. Kirk, in response, said, "If Dr. Allan had been at the Columbian Dental Congress, he would have seen a lamp which I think will supersede any of the mouth illuminators we have yet been shown, one which is certainly a unique contrivance. It consisted of a small illuminator, such as has been shown you, but in front or back of it was a parabolic reflector, made of vulcanite and brightly polished on the inside. The lamp was set in about that way [illustrating it as sheathed in the reflector]. The encasement was carried around in front, and in a socket towards the front was set a glass rod which could be bent in any shape, curiously enough, almost at right angles. This end [illustrating] perfectly plain, and so fixed that the light was reflected or condensed from this parabolic reflector and thrown into the end of the rod and conducted

down the rod. The great advantage of this electrode was that it could be bent in any direction, and it could be carried to any spot in the mouth, the advantage being that the rod never became heated, and the illuminating power of the lamp was something remarkable. It made the diagnosis of pulpless teeth perfectly feasible, and has been used for determining the question of the collection of fluids in the antrum. I think that is an improvement in the idea Dr. Allan has shown here. I have sent to Paris and tried to get one of the lamps. The difficulty so far has been the fact that the amount of heat collected and thrown against the bulb of the lamp is sometimes great enough to soften the lamp. For the purposes of illumination I think it is the best arrangement I have ever seen. The arrangement for annealing gold is not satisfactory. He says that the wire gauze cuts off the gases. It cuts off the flame the gases go through."

Dr. Truman.—How about the safety lamp?

Dr. Kirk.—The gas goes through, but it does not ignite.

Dr. Allan.—I won't discuss the question, except to say it works satisfactorily. It anneals gold, does not overheat it, and the annealing is as perfect and complete as with a spirit-lamp.

As to the lamp, what Dr. Kirk refers to it does not affect the construction of this one. It is only something added to it. Further, this one you can obtain, and the other you cannot. This gives ample light and aids greatly in making a correct diagnosis in many doubtful cases. The lamp I intended to bring over was, unfortunately broken just as I was coming away. It has a little vulcanite back to it so that the side that is to be next to the tongue is protected, not only by the rubber shield, but the shield is set in plaster and asbestos, so that you can use the lamp quite a little while before the heat penetrates the plaster and asbestos. It only takes half a minute or a minute to make an examination of a pulpless tooth, so that the heat will not be perceptible.

(Dr. Allan next exhibited some cases illustrating appliances for holding the teeth in place.)

The first represents the case of a patient where a tooth had been brought in place by an elastic, and after a few days a gold plate was made and fitted to the palatal surface of the teeth and held in place by three little pivots attached to the plate and cemented in position. The tooth is now held firmly in position. The patient was about fifty-five years old.

The next represents a case where a second molar was loose. The patient has worn the brace something like four years, giving

much comfort and prolonging the life of the tooth. Without it, in a day or two the tooth becomes sore, and if it were removed the tooth would soon be lost.

In the use of sulphuric acid in a ten per cent. solution, with this little platinum spatula, I find I can remove tartar very easily. Ever since Dr. Kirk put in my hands some asbestos fibre, which is as fine as cotton, I wrap a little of it around the blade, and I can carry the asbestos fibre, after dipping it in the acid, around the roots in places that I could not reach in any other way, and by a little mechanical rubbing or abrasion with the asbestos fibre and sulphuric acid the tartar is loosened very rapidly. With this and ordinary chisels you can go over a mouth and remove at least nine-tenths or all of the tartar with it and not injure the gums in the slightest degree, and certainly not the alveolar process.

Dr. Allan then read his paper on "Pyorrhœa Alveolaris."

PYORRHŒA ALVEOLARIS—THE OTHER VIEW OF IT.

BY GEORGE S. ALLAN, D.D.S., NEW YORK.

MR. CHAIRMAN AND MEMBERS OF THE ODONTOLOGICAL SOCIETY,—My excuse for being with you this evening seems to be twofold,—first, it was a pleasure to accept your kind invitation, and, secondly, I thought I had something to say worthy of your attention; but as to this last, the more I think over what has been said and written on my subject, the more doubtful I feel as to the wisdom of my coming. It is true I have some definite and settled views as to both the cause and the proper treatment of the so-called disease, pyorrhœa alveolaris, but I doubt much now whether I can impress you with the conviction that they are either new or specially valuable. But this I can say: They seem good to me. They help and guide me in my daily work, and I am convinced they look towards the truth. Then, in addition, my good friend Peirce has, in a measure, stirred up my combative disposition, and so I waive my scruples and misgivings, and bring you such food as I have for your mental repast this evening.

The hard and increasing work and study on pyorrhœa alveolaris is most encouraging, as to the results attained and to be attained in the treatment of this most troublesome disease. It is but a short time ago that the average practitioner wholly declined to even attempt its treatment, and advised his suffering patient to either have the offending member extracted at once or to suffer in silence,

for he knew no means of alleviating the pain, much less of saving the tooth. The disease was akin to old age, and, like old age, was not amenable to treatment, and was equally hopeless. The *vis inertiæ* of utter ignorance as to the causation of the disease was too great to be easily overcome, and few dentists cared to waste either time or effort in the way of treatment. This happily is not now the case, and most of us are glad to be able to offer our patients some hope in the way of temporary, if not complete, salvation, and almost always are able to alleviate pain and discomfort.

Teeth are lost in one of two ways,—either through a destruction of their substance by decay or of their foundation; that is to say, they loosen in their sockets and fall out, or become so troublesome that they must be taken out. With caries, so-called decay of the teeth, we have nothing to do to-night.

The physical aspects or conditions found where the foundations of the teeth are destroyed vary very much, but for our purpose it is not necessary to enter into a close analysis or comparison of them. Leaving out of question what may well be called a senile loosening and consequent loss of the organs,—that which is solely a result of old age, where the gums and alveolar process disappear, waste away by absorption, exposing more and more, as time passes, the root, until at last the socket disappears, and the tooth is simply thrown off for want of support, a condition well understood and as hopeless for treatment as the age of the patient itself,—we have a variety of other conditions looking towards the same result if neglected, but which offer a fair field for investigation, study, and treatment, with the promise of more or less hopeful ending.

The day is past when the educated dentist can dismiss a patient with the statement that his disease is hopeless and that he will have to lose his teeth one by one as time goes on. For our purposes it would be a waste of time to go into any detail of the symptoms and conditions which mark the inception, progress, and ending of this disease, my object being only to draw attention to one or two special points. First let me say there is only one generic term I know of that will apply to all cases, the appropriateness of which cannot be questioned. The term is "luxation of the teeth." If to this generic term the two specific ones, pathogenic and traumatic, be added, we have a nomenclature that will fit all cases and conditions that present themselves. For it is true the presence of tartar in any of its varying forms is not essential to the disease, and the same can be said of pus. That, too, is often found wanting. An inflammatory condition in either the acute or

subacute form may or may not be present, but the work of destruction goes on just the same. Necrosis of the processes is only an adjunct at times, and so we can go through the list. And it is not so rare a thing to find a case in which tartar, pus, inflammation and necrosis are all wanting, at least to all ocular evidence, and the disease still be present and progressive in its nature. In our present state of knowledge, it would be difficult to make strong assertions as to the rôle that germs play as a causative agent or agents. They, alas, seem to be omnipresent; but the amount of influence they exert for evil we have no present means of determining with exactness. One or more of the conditions named may be present, and some are much more common than others. They each and all are important or unimportant as the case may be. The fault we find with the classifications of Drs. Black and Peirce is that they do not recognize this fact.

Dr. Peirce's terms are but modifications of Dr. Black's, and by the introduction of the word "calcic" he recognizes the presence of tartar as the essential factor, the vice *par excellence*, to be sought for and eradicated, in combating the trouble. Dr. Black's terms, "serumic" and "phagedenic," go further, in that they recognize other factors besides the blood-serum and saliva as the sources of the active agents we seek for,—the power behind the throne. It appears to me very necessary that we should bear all these facts in mind if we want to be able to correctly diagnose and treat pathogenic or traumatic luxation of the teeth.

There may be said to be two camps of theorists in reference to this somewhat vexed question,—those who hold to the belief of its constitutional nature and those who refer it to a local exciting cause, and each side is quite sure it is right. A bias or preconceived opinion in any direction is hard to overcome. We are all more or less the slaves of our prejudices and opinions. There is a German school which takes the ground that all the diseases of the teeth are due to some constitutional vice, and as a consequence frown upon all local treatment, and take their pills, powders, and liquid medicines philosophically and in good faith. Now, I am one of those whose faith in the constitutional vice theory is very limited, and I feel quite certain that for all practical purposes the disease has a local origin, and that effective treatment must be based on this belief.

Therefore I look upon the paper which our able and scholarly colleague Dr. Peirce lately read before the New York Odontological Society as calculated to mislead and befog us, rather than to clear our vision and help us in a practical way. And yet no one of you

more highly appreciates the great value of that paper, or more readily acknowledges the sincerity of purpose which pervades it, than myself. I confess also that I offer my criticisms upon it with many doubts and misgivings as to my ability to carry you with me.

First let me say that after hearing the paper read, and then carefully reading it in the January INTERNATIONAL DENTAL JOURNAL, I find but one new thought in it; or rather, I should say, there is in it one old thought with a new prop or support to it. Briefly stated, it amounts to this: pyorrhœa alveolaris is a constitutional disease, and indicates a gouty diathesis, because a chemical examination of the deposits on the teeth shows the presence of free uric acid. The learned doctor, I think, has given us too broad a generalization from a limited amount of support. To properly and rightly present my arguments and conclusions, I quote from the printed paper.

"Specimen No. 1 contained, as shown by microscopical analysis, a number of fine needle-crystals of calcium urate, a few crystals of free uric acid, and crystals of calcium phosphate. Destructive distillation analysis yielded a strong ammonia reaction. The murexide test for uric acid and its compounds was faint, though the characteristic color showed in several places.

"Specimen No. 2 presented the same crystals on microscopical investigation. The murexide test was strong, producing a number of purplish-red spots.

"Specimen No. 3 yielded similar results.

"In addition to these three analyses by Professor Congdon, some six or eight specimens were examined by my friend and colleague Professor A. P. Brubaker, M.D., D.D.S., in my library and in my presence, the results obtained corresponding to those of Professor Congdon. In three of these an abundance of urate of soda crystals were observed. It must be remembered that, as the quantity embraced in each specimen was small in amount, large results could scarcely be obtained or expected."

Puzzling my mind over these analyses, those obtained by Dr. Peirce and those found in the books, the thought came into my mind that an independent one might help; so I interviewed my friend Professor Ricketts, of Columbia College, and obtained his assistance. Two samples, as his report shows, were given him. The one marked No. 1 was composed wholly of the black or serumic tartar from the roots of a number of teeth. The other, marked No. 2, was from the teeth of a patient having a strongly marked gouty and rheumatic condition of the system, partly an inheritance, partly acquired. The former was placed in the professor's hands

together with the published paper of Professor Peirce, with the request that he would make an analysis for comparison with those given by Dr. Peirce. The latter material was sent him just as it came from the teeth, with the request that he make a test for the presence of uric acid. Of course, this latter was not pure. It was mixed with the usual *débris* found in such positions and a large amount of salivary tartar. Still, there was a fair proportion of the black tartar present. With the above explanation, I now give you Professor Ricketts's report.

"CERTIFICATE OF ANALYSIS.

"NEW YORK, February 5, 1894.

"DEAR SIR,—The sample of tartar from teeth from ——, marked 'No. 1,' submitted for analysis, contains: Total solids, 63.80 per cent.; total organic matter, 36.20 per cent. The organic matter contains trace of uric acid."

"CERTIFICATE OF ANALYSIS.

"NEW YORK, February 5, 1894.

"DEAR SIR,—The sample of powder from ——, marked 'No. 2,' submitted for analysis, contains: Uric acid, none.

"Yours respectfully,

"RICKETTS & BANKS.

"To DR. GEO. S. ALLAN,

"51 West Thirty-seventh Street, New York."

These analyses prove, granting that they are accurate and contain no errors as to facts or conclusions, that a trace, and trace only, of free uric acid may be found at times in the black or serumic tartar commonly found clinging to the necks and roots of teeth in ordinary cases of pyorrhœa alveolaris. Dr. Peirce, I believe, claims more, but I question whether he can rightly do so.

The analysis (Dr. Peirce's) was qualitative only, and qualitative in respect to one constitutent only. Now, at various times there have been quantitative analyses made of this same black deposit, and in no one of them do I find any reference made to the presence of uric acid. This fact alone would go to show that uric acid cannot enter largely into the composition of black tartar, for if it did it would certainly have been detected at an earlier date by some one of these chemists. Dr. Ricketts's was quantitative in part, so I take it for granted that we have to deal with a very small amount of uric acid,—so small that it would not seem to be safe or prudent

to build so comprehensive a theory upon it, to the practical neglect of the other ingredients that go to make up the bulk of the deposit.

Again, free uric acid in the system does not necessarily prove a person to be either gouty or rheumatic. It is undoubtedly a symptom, and a strong one, but not a conclusive one. Free uric acid is frequently found in the blood-serum of persons who have neither a rheumatic nor a gouty tendency, and in these cases rather points to a condition of the system where destructive metabolism is in the ascendency. Waste is going on more rapidly than repair. Overwork, nervous or physical exhaustion are, as a rule, associated with this uric-acid condition of the system,—so much so that it is considered one of the most positive diagnostic symptoms of a run-down or enfeebled condition. A changed condition of life—one of rest, recreation, and enjoyment, followed by a building up of the system—will be followed almost immediately by the disappearance of the excess of waste products, including the uric acid and urates.

As further proof of the correctness of this position, I quote from an article in the *American Journal of the Medical Sciences* for February, 1891.

"V. Jaksh has examined the blood of patients in the effort to determine,—

"1. Whether uric acid took part in the acid intoxication occurring in febrile conditions.

"2. Whether it took part in the production of gout or attacks of gout.

"He refers to the statements which have already been made in support of this view, but says that investigations in the matter have never been carried out on a large number of patients.

"In all, he examined the blood of one hundred and five cases in a manner described by him. In nine cases of healthy individuals no uric acid was found. In nervous diseases it was also absent, and the same was true of nine cases of typhoid fever. In another case of this disease and in one of intermittent fever there was no uric acid present during the elevation of temperature, though it was detected after fever had disappeared.

"In the instances of diseases of the liver, stomach, and intestines examined, uric-acidæmia was only observed where anæmia was also present.

"The acid was found in diseases of the heart which produced cyanosis, as also in emphysema and pleural exudates. It was constantly present in considerable quantity in the febrile stage of five

cases of pneumonia. In six cases of acute articular rheumatism there was no uric-acidæmia observed.

"Very considerable quantities of uric acid were found in all the cases of diseases of the kidneys, and in those of primary and secondary anæmias. These observations seem undoubtedly to prove that uric-acidæmia is not a pathognomonic symptom of gout."

Again, in "The System of Medicine," Pepper, article by Dr. W. H. Draper on gout, you will find this strong assertion:

"But apart from these physiological objections to the theory that uric acid is necessarily the offending substance in gout, it is well known that uric-acid salts accumulate in the blood in febrile diseases, in disorders of digestion, and in anæmia,—notably in splenic anæmia,—and do not produce either the symptoms or lesions of gout."

If Dr. Peirce is right, the presence or non-presence of pyorrhœa alveolaris would be a strong diagnostic symptom or the contrary of the gouty condition. But this is not the case; at least, physicians do not so consider it. In fact, there seems to be no recognizable connection between the two. For years I have been in the habit of asking patients coming for treatment if they were either gouty or rheumatic, and the answers, grouped together, have had only a negative value. I have been exceedingly anxious to find some constitutional vice that would bear the brunt of the trouble; and as it was in the air, as one might say, that gout and rheumatism were the suspected causes, I have seldom, if ever, neglected an opportunity of obtaining reliable working data to help in forming a correct diagnosis. I am sorry to have to report no satisfactory conclusions. A strong objection to the whole theory lies in the fact that, whereas depositions of tartar are so common as to be almost a rule in middle life and old age, I am thankful to say gout and rheumatism do not bear an undue proportion to the other ailments humanity labors with.

But let us, for the sake of argument, accept the conclusions the learned author arrives at, and see where they land us. Gout and rheumatism, especially the former,—or, to state the case in another way, all manifestations of either disease,—are followed by deposits of lime salts in the joints or other positions, and are deemed to be the most intractable of all diseases to treat. The deposit once formed, refuses to be dislodged. It cannot be reached. The blood-serum can carry fresh supplies of the objectionable material, but it cannot, no matter how it may be changed in character, redissolve it, take it back into the system, and dispose of it through any of the ordinary excretory channels. The same may be said of urinary

calculi; and the poor mortal who has once passed one of these latter, no larger than a small pea, has had most painful evidence of the truth of this statement.

Now let me ask you the question in this latter case, Is the uric-acid state of the system the cause of the inflammation, pain, and distress, or is it the little lime nodule that happens to be situated where it is decidedly not wanted? How formed or whence came that nodule has nothing to do with the train of distressing conditions that it produces. It is a cause sufficient unto itself for them all. The vice in the system did form the nodule, but there its evil work ceased, and the nodule takes up the work where the vice leaves it. And as to these results, neither physician nor patient cares whether this nodule is composed of calcium phosphates, carbonates, or urates. They only want to get rid of it, and they work and labor only with that object in view, and they both know that when that is attained peace, comfort, and health return.

Now, I hold that the chemical constitution of this deposit has nothing to do with the train of evil results that follow its formation, though Dr. Peirce strongly intimates and accepts a contrary opinion. This you will see from the following quotation: "The fact, however, that in true pyorrhœa the symptoms are so different, and that all local treatment has been practically so unavailing, has suggested the possibility that some other chemical agent derived from the blood, and the product of some morbid constitutional state, might be the exciting cause," and he bases his argument strongly upon this belief. Now, it is most certainly true that no constitutional treatment can cause the blood-serum to take this deposit—let its composition be what it may—back into its current and carry it away. Professor Peirce says, "It is for this reason that I regard the disposition of uric acid as of blood origin, and the disease pyorrhœa alveolaris as one of the local manifestations of the constitutional state familiar to all pathologists as the uric-acid or gouty diathesis." If this statement were true, then the removal of the tartar and other local treatment would be unavailing, and a cure could not be effected, no matter how completely the parts were brought into a healthy condition. But this we know not to be the case. Cures are being constantly effected, though unaccompanied by constitutional treatment.

These reflections lead to one inevitable result. For all practical purposes, the constitutional-diathesis theory must be abandoned where treatment is to be adopted; and this I say fully impressed with the importance and value of the work done, and the facts brought

to light as to the causation of the disease in what may be said to be the last analysis. Back of the local excitants and other factors of like nature that are the immediate cause of the disease, the wise man will seek means of prevention. But prevention and cure are two widely different things to think about, and call for as widely different means to attain the end sought for. Constitutional faults or vices do indeed lead to deposits of tartar, but when the tartar has been once deposited on the necks or roots of the teeth it starts in business on its own account, and on lines and in ways that its constitutional father never dreamt or thought of, and with results in the way of manufactured products that clearly indicate its ability to take care of itself. So by all means let the good work of the constitutional diathesis theory workers be encouraged. The more they can do for us in the way of prevention the better; but we must not let them throw dust in our eyes, and lead us astray with the delusive hope that we can mend a broken head if we can only catch the boy who threw the stone and send him to the nearest Sunday-school.

It may be well to close with a few words in reference to treatment which appears to be most effective; and here let me say that, with many others, I hold that the present state of our knowledge does not permit of such a thing as a radical cure in any but a few exceptional cases, but I do most fully believe that much can be done, especially in the earlier stages of the disease, to ward off its evil effects, and even effect a permanent change for the better.

If my view be the correct one, these lesions and pathological conditions have their origin in some mechanical or chemical irritant obtaining a lodgement under the free margin of the gums, and to one holding this opinion it is not necessary either to underrate or deny the indirect influences that systemic cachexies have, either in aggravating or inviting them. Good judgment must be used in weighing the value and importance of each and all.

Looking at the condition of the teeth and adjacent soft tissues from a clinical stand-point, we find them much as follows:

1. As a rule, if the gingival borders have a healthy normal appearance and the teeth are not shaky, we may be assured that though the disease has obtained a lodgement, it has attained no great headway.

2. Any departure from this condition shows progress in the disease, and that, too, just in proportion to the amount of the departure from the normal state. The thing to be done is to bring back the parts to the healthy condition, first, by removing the

direct cause, and, secondly, by following the removal by local health-inducing treatment of the affected parts.

"Let it be recalled that in this form of the disease the morbid process begins at the root, and very frequently, if not usually, in the vicinity of the apical extremity."

This statement seems to be erroneous, and contrary to ordinary observed conditions. So far as my observation goes, the deposit is first formed just under the free margins of the gums, and in rare cases only at the apical ends of the roots, and I have yet to see a case where the so-called pocket did not point the way to reach it. Dr. Black, whose authority to speak is unquestioned, in the "American System of Dentistry," classifies pyorrhœa alveolaris, without question or exception, as a disease having its origin at the necks of the teeth; and if any other authority of note, excepting Dr. Peirce, does otherwise I do not know it. Kindly allow me time to use the black-board to illustrate my position, and I cannot do better than to make use of three marked cases that have come under my notice since deciding to come before you.

Now, a word as to how the deposit, where we have to deal with serumic tartar, is formed, and its nature. It is not easy to go back of the theory that the lime salts composing the deposit have been carried to the parts through the medium of the blood-serum, but it is no slight problem to indicate how it has been accomplished. Possibly the principle of diffusion may account for it, but it cannot be so stated positively. In the large majority of cases the deposit in the early stages will be found just under the free margin of the gums and above the peridental membrane, and this would seem to show that it could not have been directly carried to the parts by the blood current. In some way the plasma, weighted with the salts, is exuded or pressed through the membranes, and attaches itself to the necks of the teeth. The formation of tartar deposits is a gradual one, and as it goes on it is brought more or less under the influence of the saliva and other fluids in the mouth; to what extent these may modify or change its nature we can hardly guess. But the probabilities are that they do affect the characteristics, physical and chemical, of the deposit to a considerable degree, and there is little doubt that the *débris* of the mouth also forms a part of the deposit. Microscopical examinations indicate this very strongly. I am not in a position to question the judgment of Dr. Peirce where he says, "As the current of the lymph-stream is directed for the most part towards the cementum, through its borders or periphery into the lacunæ and canaliculi, and finally in the

reverse direction, it is not difficult to see why the deposit should take place on the surface of the cementum as well as in the meshes of the alveolo-cemental membrane." But I confess I do not quite understand what Dr. Peirce means by his reference to the lymph-stream; but it seems to me that proof positive that it is so formed and deposited is wanting, other than it may be in a few exceptional cases. The deposit as found is amorphous; no crystals ever go to form any part of it, and it is not constant, so far as we know at present, either in its chemical or physical characteristics.

The ways of removing deposits on the teeth are at our command,—the mechanical and the chemical. As to the first, it is mostly a matter of skill, controlled by the educated eye and touch. Force to any amount is seldom required, and never to the extent of injuring the soft tissues or the alveolar processes. Dr. Van Woert, whose most excellent paper on this same subject may be found in the January, 1894, number of the INTERNATIONAL DENTAL JOURNAL, is wholly right in what he says on this point. The chemical agent I mostly rely upon is sulphuric acid, using a ten-per-cent. solution of the pure manufacture.

One point I would lay special stress upon, in closing, is the vital necessity where teeth have become loosened in their sockets in some way to give them support. The constant motion of a shaky tooth of itself rapidly destroys what foundation is left, and all work is useless that does not contemplate holding the teeth firmly in place as of the first importance.

DISCUSSION.

Dr. Peirce.—I have prepared a paper to read this evening, but as it is late, and I desire to hear from others, I will occupy but a few moments. I would like to ask Dr. Allan if he presents these casts as representing cases cured through local treatment? [Dr. Allan answered in the affirmative]. I never in the paper to which the essayist has devoted his criticisms made a single allusion to what is called, and recognized from its color, black tartar. I never made a single allusion to the tartar that was deposited from the saliva—which the black evidently from its location is—as being the cause of pyorrhœa alveolaris. I did not say that black tartar was not deposited from saliva, but believe that it is, as every one who recognizes its location must. I never saw a case of pyorrhœa occasioned by black tartar; inflammation of the gingival borders of the gums is the extent of its disturbance. It is entirely different from the deposit examined by Professor Congdon, of the Drexel Institute.

Different in its location, structure, and color; different in its origin. Certainly there is no one here who has not recognized the presence of black tartar and its local influence on the gum. It never goes beyond the fifth of the length of the root towards the apical end; it is confined to a locality just under the gum margins.

The tartar examined by Professor Congdon was taken directly from or near the apical end of the root, and where there could be no connection with the gingival borders whatever. His specimens were deposited by or from the plasma of the blood, and could not have come from the saliva, because the locality and structure prohibited intercourse between the parts. The product from the plasma of the blood was what Professor Congdon analyzed, and it was his critical analysis that was published in the paper to which allusion has been made. Dr. Allan says he is not familiar with any one who has taken similar views with myself. I would like to read an extract from a paper placed in my hands two days since by Dr. Faught, which says,—

"I am of the opinion, however, that the deposition of the concretions upon the roots of the teeth in those localities not easily reached by the saliva, or in which the presence of the saliva would be an impossibility, is due to the causes which produce the chalky formations found in the joints and fibrous tissues of gouty and rheumatic individuals.

"The thought has occurred to me, though I have not had time to demonstrate it positively, that the concretions found upon the roots of the teeth in the locations just named were masses of urate of soda with phosphate and carbonate of calcium, and that they are deposited directly from the secretions, as is often the case in rheumatic arthritis."

Furthermore, it would seem that these concretions were the cause of the inflammatory condition rather than the result of it; in proof of this let me state that clinical observation teaches that suppuration often occurs about the roots of the teeth at remote points from the gum margin, and which have no outlet until the pericementum is dissected from the roots of the teeth by the accumulation of pus. I have seen cases in the lower jaw in which an abscess had been formed upon the roots of living teeth, between the neck and the apex, and in which the attachment of the gum at the neck of the tooth was intact, and the pus did not escape until nature had perforated the soft tissue, or relief was given by the use of the knife. In such cases I have never failed to find concretions upon the root at the point of suppuration; and this could not possibly

have been deposited from the saliva, and it is fair to presume that the deposit upon the root was the source of irritation that produced the abscess, rather than that the inflammatory condition was produced by some remote cause, and the formation of the deposit the result of the inflammation.

Phagedenic pericementitis is sometimes directly traceable to a rheumatic condition of the system or the uric-acid diathesis. In several cases in which I have analyzed the urine, uric acid was found largely in excess of the normal quantity.

In all of the cases which I class as rheumatic, concretions are found upon the roots of the teeth, and many times in locations which preclude the possibility of salivary origin.

Under restricted diet, in which meats, wine, and malt liquors are cut off, there is soon a marked diminution in the quantity of uric acid excreted, and an equally marked improvement takes place in the symptoms manifested in the oral cavity, which cannot be accounted for by the removal of the concretions and local treatment alone. In one case, which has been under observation four years, the periodical aggravation of the oral symptoms are a sure indication of the presence of an excessive amount of uric acid in the urine, and as soon as this condition is corrected the inflammatory conditions of the pericementum are greatly relieved. Local treatment is necessary, but this alone is not sufficient; we must strike deeper and correct the morbid condition of the system if we hope to effect a cure.

That is the testimony of Dr. John S. Marshall, of Chicago, who says he has seen cases where there has been deposit without destruction of the gum margin. It was only last week or within a few days that a patient came to me from Dr. Mary H. Stillwell, of this city, where the left cuspid tooth was as vital as a tooth could be, having an abscess opposite the apical end, and on this end there was a rough incrustation. The pulp was undoubtedly alive.

Dr. Allan.—No sinus?

Dr. Peirce.—No trace of a sinus or pocket. I have seen three wha- xactly like it,—teeth where there has been an abscess and made a b retained its vitality.

saliva—whi —You didn't know anything about the end; you didn't cause of pyor.

not deposited fro No, but I examined it without an instrument.

recognizes its loca s the incrustation there before the abscess formed, sioned by black tar wards?

gums is the extent sume it was there before the abscess was estab-

the deposit examine extent the cause of it.

Dr. Truman.—What evidence have you that the pulp was alive in that tooth?

Dr. Peirce.—It was not off-colored when there was a strong light thrown upon it; one cannot easily be deceived. It is as certain as it is possible to ascertain anything. Besides, the abscess healed without disturbing the pulp-chamber or canal. Now, in regard to another point. I have in the last three months had twelve cases of pyorrhœa under my charge, and with the exception of three occurring in school-teachers, every one had other indications of gout. There are gentlemen here to-night who can give stronger evidence than this. The association of pyorrhœa with gouty diathesis is certainly so true that it cannot be gainsaid. Let me say that Dr. Allan's paper may be all true from his stand-point. If he did not take the product from blood plasma, he could hardly expect to find uric-acid compounds. Tartar on the apical end of the root is not black tartar, but is of a very different composition. Tartar found in that locality usually comes from the blood, while that on the crown and neck is undoubtedly from the saliva.

Dr. Allan.—Referring to this same article of Dr. Peirce's, I find on page 2 the following. But first I would say that in that article he failed to draw attention to a third kind of tartar. In my paper I did not deny that there were cases at times which seemed to point to some other causes of pyorrhœa alveolaris than the purely local one at the neck of the tooth. In his paper, Dr. Peirce refers to a special kind of tartar. In his article in the INTERNATIONAL DENTAL JOURNAL, he says, "In the first place, I believe that while pericementitis is associated with calcic deposit, the origin of the calcic salt and the antecedent condition which determines the locality and character of the deposit as well as the train of totally distinct symptoms which follow, lead inevitably to the conclusion that two different diseases have thus far been confounded. In one form of pericementitis the origin of the calcic salt is the saliva, and in the other form, the blood." The calcic deposit Dr. Peirce refers to and the tartar of Dr. Black are one and the same thing. So I was perfectly right in presuming he drew attention to the same kind of tartar referred to by Dr. Black. He says, "The former I shall designate as ptyalogenic calcic pericementitis, expressive of the idea that in its origin it is local, peripheral, and salivary. The latter I shall designate as hæmatogenic calcic pericementitis, expressive of the idea that in its origin it is constitutional, central, and associated with some modification of the normal composite of the blood plasma." That is the serumic tartar of Dr.

Black. Dr. Peirce fails to draw attention to a third kind of tartar. Now, here he says, "I have had some specimens of this tooth deposit examined by Professor Congdon." A person is very easily led astray if the doctor cannot be more definite, and I can only say that what he refers to is the ordinary black deposit. It is a cause of pyorrhœa, but not the only cause by any means. I have seen cases of pyorrhœa where there was no deposit of any kind that I could detect.

Dr. Kirk.—My knowledge of this particular phase of the subject arose two days before I had a conversation with Dr. Peirce upon it. My attention was called to a case that had been sent me over six months ago by Dr. Harrison Allen, for relief of pyorrhœa alveolaris, to see if I could do something to relieve the distress. It has now been over six months since I had the case under observation, extending over three or four treatments. When the patient first came to me the lower incisor teeth and two of his bicuspids, as nearly as I could recollect, were affected with pyorrhœa in a form almost as bad as the worst case I ever saw. I told him frankly that I believed it was only a question of a short time before he would lose his teeth; that what I should do would be simply palliative, and would only put off the evil day. As carefully and thoroughly as I could I removed the deposits from the roots of the teeth, and after applying the ordinary antiseptics and stimulating treatment which we give these cases, I dismissed him.

I saw him six months or so afterwards, which was two days before reading Dr. Peirce's paper before the Odontological Society of New York. I noticed that as he came up my stairs he looked brisk, well, and happy, whereas, before, he had the appearance of a chronic invalid. I examined the mouth, and it was as healthy and as clean as any mouth I ever saw. There was a restoration of the tissue, and the mouth was in splendid order. I have treated a great many cases, but never saw such a result. I knew as soon as I saw him that my treatment had not done it. I asked him what he had done. He told me that he had been under treatment all his life for various ailments with but little benefit, but Dr. Allen had put him under a strict gouty *régime.* When Dr. Peirce was relating the substance of his paper to me I reported this case to him as one which, in my belief, illustrated perfectly the truth of his theory.

It seems to me that the principal point at issue to-night hinges upon the analysis of these concretions and their origin. Two methods of analysis are applied to the investigation of tartar. One by which the approximate constituents are determined, and those

by which the ultimate constituents are determined. The analyses quoted by Dr. Allan are of the sort in which the ultimate constituents alone were shown. If you pay attention to the report of results of the analyses you will observe that the tartar contained so much organic matter, so much water, and so much carbonate of calcium. If any uric acid or urate of calcium had been present, it would in this case be measured in terms of organic matter and calcium carbonate. In other words, it would not have shown uric acid under the circumstances, even if any had existed.

The analysis of tartar which Dr. Allan sent to Professor Rickets is also faulty in this particular, that it had been collected from pyorrhœa cases with open pockets, and it is tartar of an indeterminate sort; probably a mixture; and yet that analysis did show uric acid present. I have not had a case so far in which I could determine the question whether there is a deposit of concretions around the roots of teeth without some breaking in the gum margin. I believe there is. Personally, I have not made the observation. Dr. Allan says he never has seen a case where there is concretion around the roots of the teeth, without a break in the gum margin; that all cases which he has examined have formed from the gum margin downward. Of course that may be true, because those are the only cases we have been taught to observe.

I have a tooth in my own mouth in which the pulp is still alive, and there is quite a bunch about that root resulting from alveolar abscess. I have four or five teeth which, if I am indiscreet in the matter of eating, become very sore; but since I have been taking especial care in a dietetic way and living within the limits of a gouty *régime* I have had no trouble.

I have some fifteen patients—pyorrhœa cases—at present under a strict gouty *régime*, and I hope to be able to report on these later.

I had, a few days since, an opportunity of observing in the case of a lady patient a gouty outbreak simultaneously with an acute attack of pyorrhœa inflammation, where the gingival margin around the teeth was much swollen and painful; her hands showed that she had the typical gouty condition; that she had just been passing through an exacerbation of gout with the acute pyorrhœa inflammation simultaneous with it.

Dr. Thomas.—Any one who has been the victim of impaired or perverted digestion will readily recognize the constitutional causes of gout and rheumatism. A few years ago I had occasion to go upon a milk diet for six months, not even eating a cracker in that time. Previously, while getting into the condition which made the

milk diet necessary, I suffered greatly with rheumatic pains and gouty symptoms. After resuming the normal diet it was easy to discover what it was I had eaten that either increased or decreased the rheumatic or gouty symptoms.

There was no organic disease of the digestive organs, but their ability was impaired by reduced nerve-force, brought on by overwork. To eat at one time too much was as bad as to eat or drink articles of food which should be prohibited.

Dentists especially, but people in general, do not get out-door exercise enough to utilize the stronger foods, and should confine their diet to such as will be assimilated readily. This winter I have left beef entirely alone, and my general health was never better, and I have not had a twinge of rheumatism or gout. I have noticed that during the times when I had evidences of imperfect digestion that pyorrhœa always accompanied the condition, the same as gout and rheumatism. Since Dr. Peirce's paper has appeared I have taken pains to inquire of eighteen or twenty patients suffering from pyorrhœa if they ever suffered from rheumatism or gout, and they have all of them answered "yes;" and, upon further conversation, they have all claimed that beef was their principal animal diet, and they did not see how they could get along without it.

Dr. Jack.—Dr. Peirce's conclusions tend to establish on definite grounds two different pathological conditions of the peridonteum which heretofore have not been clearly differentiated.

In reference to phagedenic pericementitis, it has not escaped observation that thick proliferation of the peridental membrane not infrequently occurred attended by absorption of the alveolar process, but it has escaped my attention that deposits have occurred at the apex of the roots, unless some communication has been established either by fistulous tracts transversely through the tissues or along the course of the peridental membrane, and these cases have mostly occurred with dead teeth. I have, however, observed that in nearly every instance where proliferation of the peridental membrane has taken place it was associated with evidences of the existence of the gouty diathesis.

It is not infrequent to observe attacks of gouty inflammation of the peridonteum. Sometimes this structure, from its free supply of nerve-filaments, becomes highly sensitive when neuralgic pain occurs similar to that manifested in the earliest stage of simple pericementitis.

One case in particular is worth being mentioned in this connec-

tion of over fifteen years' observation. At times, more particularly after partaking of wine, the right central would become loose, which, on the second occurrence, was diagnosed to be of gouty origin, which then was questioned by the patient.

Lately a most severe attack occurred, when tumefaction had taken place, with considerable swelling of the gum, simulating the second stage of alveolar abscess. As the tooth was not responsive to alterations of temperature, and was a little off color, I decided to drill to the pulp-chamber to give relief to a condition which I had long feared would supervene. At the half-way distance sensibility was excited, proving a living pulp. This will be perceived to be as clear a case of gout manifestation as if the tumefaction of a joint had taken place. The patient now has large gouty concretions in the joints of some of the fingers.

In one other instance, where the patient was also of a gouty diathesis, distinct abscesses occurred on two occasions of the tumefied gum, and after the evacuation of a single drop of pus, which appeared to be formed in the superfices of the gum. This case was like the previous one with this exception, and also there was a shallow deposit of thin, dark salivary calculus beneath the margin of the gum.

Dr. Truman.—The subject has been pretty well handled, and a great deal written about many of its points, until it is somewhat tiresome. I want to express gratification that we seem to be approaching a period in dentistry when individuals have come to the conclusion to work upon matter in the laboratory rather than in their own brains, and it is hoped we will have a better class of papers and intelligence in regard to many things. I want to congratulate Dr. Peirce on his work, although I cannot agree with him in his conclusions. Possibly he may be right, and I and some of the rest of us wrong. He has demonstrated, however, and with a considerable degree of certainty, that uric acid may be found around the roots of the teeth. I cannot believe he has proved that pyorrhœa is a result of this. It may be at times. Dr. Allan has alluded to one point,—that pyorrhœa begins frequently at the apical extremity. We have had it repeatedly stated here to-night that that is true. Now, I think I have had a great deal of experience both private and clinical, and I must say that I never have seen a case that I could positively determine began at the apex of the root. I do not consider it possible from a pathological stand-point that this concretion should occur at the apex of any tooth, covering the point where the pulp enters the tooth, and that pulp remain alive. It seems to

me an impossibility. The very fact that the concretions occur at the apex, and press upon the pulp, would destroy the pulp of that particular root. I know very well that with multirooted teeth we may have two of the roots alive, but the root that is particularly affected will be dead. I will just ask Dr. Peirce to examine one I have with me, and decide whether he would not think that such a tooth was a living tooth if examined in the mouth?

Dr. Peirce.—I should think the crown and buccal sides indicate vitality.

Dr. Truman.—Allusion was made in the paper to lymph or serum passing from the cementum into the dentine, and in reverse order back again to the pericementum. Now, I believe there is no question at all that fluid can pass into the dentine through the cementum, but as it passes out in reverse order, how can it affect only a certain portion of the pericementum. It should be deposited in the entire tissue. The urates will not disturb any given part unless there be a lack of nutrition in that particular point. In other words, according to the best pathologists, the tissue must have experienced a loss of tone before it can be affected by this gouty deposition. But we find pyorrhœa beginning at the gingivæ. If it begins there, it is in advance of the deposition, and therefore has had a beginning before the urates have been deposited.

If I understand it, we cannot possibly recognize the theory that uric acid is at the foundation of this disease. That it may have something to do with it may be true, but when I find that Dr. Peirce limits the beginning to thirty-five years of age, he is, in my opinion, giving the whole thing away.

I have been studying this subject for the last thirty years, and I am satisfied that pyorrhœa alveolaris does not depend solely upon a gouty condition. It is, in my judgment, independent of any of the deposits, and I cannot agree with Dr. Allan that these are usually found in pockets where pyorrhœa exists. The age limit will not, I think, hold. I have had a number of cases where the age did not exceed twenty.

I feel assured that this disease is mainly local. Constitutional conditions may be present sometimes to increase it. That it is local is evident from the fact that in all cases we can produce it. Take an individual with perfectly healthy gums and irritate them with clamps, ligatures, separators, etc., and nothing done to render the gum aseptic, there will be continued irritation and development of micro-organisms so extended that in forty-eight hours there will be incipient pyorrhœa. If this be true, and I cannot see how it can be

controverted, it cannot be said pyorrhœa is always occasioned by constitutional difficulties.

Dr. Peirce, somewhere in his remarks, said that it is a disease that is rarely cured. If that were so it would be the opprobrium of dentistry. We had better give up our practice entirely. What! cannot cure a simple irritation of the pericemental membrane! I cannot believe it. I know it can be cured.

There came to me, a year or so ago, a very difficult case. The patient had been under the care of a prominent dentist who acknowledged that he could do nothing with it. All the lower teeth were so loose that their salvation seemed problematical. I, however, began the treatment as I understood it. This proved so effectual that in six months time he came and exhibited them to me, and with one exception they were as firm as any in the mouth. The gums were healed and perfectly adherent to the cervical border.

This brings another point. The cement in these teeth was practically dead. There was no pericementum upon them. It seemed impossible that bone could form around the teeth, but it did, exactly as I suppose it forms around implanted teeth. That pyorrhœa can be cured I entertain no doubt, but whether all cases can be is still an open question.

Dr. Brubaker.—Though not feeling myself qualified to speak either on the causation or pathology of pyorrhœa, there are several statements in the papers of Dr. Peirce which find confirmation in the field of clinical medicine, and to which I wish to allude.

As to whether a pericementitis which is followed by the phenomena which characterize a case of true pyorrhœa alveolaris begins primarily at the gum margins from a deposit of lime salts from the saliva, or whether it begins near the apical extremity of the root from a deposit of organic salts from the blood, is merely a matter of observation, and should therefore be solved by an attentive study of individual cases.

A matter of the utmost importance at the very outset of this discussion is a definition of terms, so that we may all know just what is meant by the term pyorrhœa. Much confusion and waste of argument may thus be avoided.

Dr. Peirce, in his several papers on this subject, takes the position, if I correctly understand his argument, that (1) a pericementitis attended by a flow of pus may be caused by a salivary deposit of calcium phosphates and carbonates, and (2) that a pericementitis attended by a flow of pus may be caused by a special hæmic deposit

of calcium and sodium urates and free uric acid, but that the train of symptoms and pathological changes which follow these two absolutely different causes are so unlike in many respects that two distinct diseases are to be diagnosticated. If the sketch of the characteristic features of these two forms of pyorrhœa be correctly drawn, and if his observation can be substantiated by the observations of others, the justness of his differential diagnosis becomes self-evident. There is, I am told, a general consensus of opinion among dental practitioners that some cases of pyorrhœa are of short duration, yielding readily to treatment, and that other cases are of long duration, extending through months and years, attended by the absorption of the alveolar process and the eventual shedding of the teeth, and which are practically non-curable. Now, it is this latter form of pericementitis that I, in common with Dr. Peirce and other observers believe to be a local expression of the gouty diathesis, and as such to be treated along constitutional and specific lines; and my opinion is based upon the resemblance of this disease to other local expressions of the same diathesis occurring in other portions of the body. As to the chemical composition of the salts removed from the roots of the teeth by this chronic destructive form of pericementitis there is no doubt in my mind. I know from my own observation of six cases that they were uric-acid salts, and that they were not derived from the saliva.

The statement by Dr. Peirce, that every case of pericementitis which progresses to the stage of pus formation and discharge is not to be regarded as a case of pyorrhœa in the sense in which this term is generally understood, is, I imagine, accepted, by all who have had much experience with the disease, and who possess ordinary powers of diagnosis.

But that such a non-specific pericementitis may, by the addition of a uric-acid deposit, acquire those specific features which characterize true pyorrhœa is most probable. Analogous conditions occurring in all portions of the body may be readily cited confirmatory of this view. A non-specific catarrhal inflammation of the bronchial mucous membrane produced by atmospheric changes or disturbances of the pulmonary circulation, though lasting for a variable length of time, will usually yield to treatment directed to the nutrition of the membrane or to the circulation, as the case may be. Yet there is a certain number of cases which will resist all such medication. This fact, coupled with the observation that bronchitis was frequently associated with gout, induced Dr. Greenhow to investigate the possibility of a causal connection of these

two diseases. From a study of a large number of cases he found that thirty-seven per cent. had various manifestations of gout. In summing up his investigations he states it as his conviction that there is an intimate relationship between the gouty constitution and chronic bronchitis. In many instances where gout has not developed into its characteristic forms it manifests itself in the form of chronic bronchitis. He further states that in many instances no doubt the disease (bronchitis) is first developed by some external exciting cause, though frequently by a much slighter one than would be likely to produce the same effects in a healthy subject. Crystals of uric acid have in several instances been detected in the sputum of chronic bronchitis of gouty people. A gouty pericementitis finds its counterpart in gouty bronchitis. Again, a simple non-specific pharyngitis may take on specific characters when occurring in gouty subjects. In all its symptoms a gouty throat is like no other. The mucous membrane of the palate and pharynx is red, glazed, œdematous, penetrated with turgid veins, and covered with a grayish secretion. In a case reported by Dr. G. de Mussy, masses of urate of lime and carbonate of lime were discharged from the mucous follicles of the pharynx. Inflammation of the parotid glands, of the general mucous membranes of the skin, of the nerves of the viscera may, when occurring in gouty people, develop specific features which would make their relationship incontestable. A gouty pericementitis finds its exact counterpart in a large number of local inflammatory conditions in various regions of the body.

It is therefore highly probable that when pyorrhœa occurs in gouty subjects its continuance is directly connected with uric-acid irritation. An objection to this view as to the pathology of pyorrhœa has been made on the ground that, as in some instances the patient does not exhibit any of the usual symptoms of the gouty diathesis, therefore it cannot be associated with it. Now, the amount of consideration which this objection should receive will depend on the amount of attention the author of the objection has given to a study of the pathology of gout and upon his ability to diagnose the multiform phases of this extraordinary constitutional condition. When it is remembered that the gouty manifestations are often so subtle and obscure that even the most expert are baffled, is it to be expected that all dental practitioners not familiar with general pathological conditions should be capable of detecting their presence and influence? Yet I have no doubt that even a most superficial examination of the various organs and tissues of the body will reveal some gouty condition in all cases of true pyorrhœa.

As in the practice of general medicine, so I presume in the practice of dental medicine, the specific cause of a disease is frequently determined by the results which follow specific treatment. If some local persistent inflammation of bone, skin, or viscus, or some chronic form of neuralgia, or some peculiar eruption, which resist all local and constitutional treatment, should yield and disappear under some specific remedy, as mercury, quinine, colchicum, and potassium, there would not be the shadow of a doubt that there had been present some remote manifestation of the syphilitic, malarial, or gouty diathesis. Indeed, this is regarded as proof positive in the absence of all other evidence that the local trouble was but an expression of a constitutional disorder.

Now, it occurs to me, from a consideration of the histories and the results of the specific treatment instituted by Dr. Peirce, that we have all necessary proof that pyorrhœa alveolaris is a specific pericementitis caused and maintained by the deposition of uric acid and its salts from the blood into a pericemental membrane, the nutritional level of which has been lowered by some local mechanical or chemical cause.

Dr. Burchard.—Any remarks I can make would but serve to corroborate the statements and opinions of Dr. Brubaker. Dr. Allan has said, or quoted as authority Dr. Draper's article in "Pepper's System of Medicine," that the gouty diathesis is not necessarily caused by the presence of an increased amount of uric acid or urates in the blood. This is, on the other hand, regarded by Garrod, Niemeyer, Duckworth, Ebstein, and others as the distinguishing feature of this particular disorder. There is no other means of explaining the phenomena of the disease; even the trophoneurosis theory is the same element involved. Further, one would infer from Dr. Allan's statement that we are to accept the presence of uric acid or urates as an expression of an incomplete retrograde tissue metamorphosis; whatever view we may take as to this, the weight of evidence is assuredly in favor of the production of these substances being through a faulty metabolism. Lauder Brunton's writings upon the function of the liver strengthen such an assumption.

For agreement with Dr. Peirce's observations, Ebstein's theory of gout, "that it is a species of coagulation necrosis in which urates are deposited in the necrotic area," is suggested.

Garrod's experiment for the presence of uric acid in the blood serum should be applicable if not diagnostic.

As Dr. Kirk has said, the analyses quoted by Dr. Allan contain

an element of fallacy; urates, as urates, would through such means be decomposed and give reactions not as urates, but as carbonates. One analysis simply resolves the deposits into individual chemical elements, from which no conclusion can be deduced.

Dr. Peirce and Dr. Truman seem to give different definitions as to the local disease we are discussing, Dr. Truman's bearing the same relation to Dr. Peirce's that the renal effect of a large dose of turpentine bears to chronic nephritis. If the gouty diathesis view be true as a cause of disease in the peridental membrane, we should expect to find the disorder prevalent among brewery-men, who consume large quantities of malt liquors. Gout is a common disease among English porter drinkers. Is phagedenic pericementitis also? that is a question. Dr. Allan's classification into pathogenic and traumatic luxation is too indefinite; it includes but does not place this particular affection.

The form in which we are likely to see this disorder would be in the condition known as lithæmia.

Certainly decided evidence has been presented this evening to show the connection between attacks of pericementitis and the ingestion of undue amounts of nitrogenous food. This does not prove that carbohydrates form no disturbing element; they may act in the production of the gastric catarrh. The exclusive use of certain foods will produce another degenerative disorder, not often seen, —that is, scorbutus. Not that there is any similarity, but it is an evidence of the effect of diet upon health.

Adjourned.

At a regular meeting of this Society, held March 10, 1894, at 1228 Walnut Street, Philadelphia, President Darby in the chair, Dr. C. N. Peirce read a paper on "Pyorrhœa Alveolaris," and at the close cited two or three cases confirming the statements contained in the paper.

FURTHER REMARKS ON PYORRHŒA ALVEOLARIS.

BY C. N. PEIRCE, D.D.S., PHILADELPHIA.

In two previous communications, one published in the International Dental Journal for January, 1894, the other in the *Dental Cosmos* for February, 1894, there are stated, with some detail, views which I entertain, and which appear to me to be sustained by recent experience, regarding the etiology, pathology, and treatment of pyorrhœa alveolaris.

In these two papers facts and deductions are presented which, if rightly interpreted, it is believed will establish the kinship of pyorrhœa, or as previously designated, hæmatogenic pericementitis, with the gouty or uric-acid diathesis.

The conclusions entertained may be well represented in a condensed form in the following postulates,—viz.:

1. The inflammatory stage of true pyorrhœa alveolaris primarily begins in tissues on the side of the root near the apical extremity, and secondarily advances in the very large majority of cases towards the gingival borders.

2. The cause of this inflammation, or gingivitis and pericementitis, is the plasma exudation from the blood-vessels freighted with salts, which, in their deposition and crystalization upon the cementum of the root and infiltration of the more vascular tissues, exert the influence of foreign bodies and react as irritants.

3. The salts in question, as disclosed by chemical analysis, are calcium and sodium urates, free uric acid, and calcium phosphate.

4. The chemical nature of these salts indicates a condition of the blood in which there is an excess of uratic salts and uric acid, due to either *increased formation* or *imperfect elimination*. The excess of these salts, as is well known, is regarded by general pathologists as indicative of a faulty nutrition, and is the immediate cause of a series of local disturbances to which the term gouty has been applied, the nutritional disturbance being known as the uric-acid diathesis.

5. An attentive study and accurate observation of the various

organs and tissues of patients suffering with pyorrhœa alveolaris have disclosed the co-existence, in a very large proportion of them, of one or more local expressions of this constitutional diathesis.

6. Recognition of the fact that a constitutional malady presents itself, one phase of which only has claimed the attention of the dental practitioner, indicates that a treatment designed to be curative must have reference not only to the local expression, but especially to this important systemic condition as well.

7. Results from constitutional treatment in connection with the usual local applications in a number of well authenticated cases of pyorrhœa have been so markedly satisfactory that the writer feels fully justified in his assumptions regarding the origin of the disease.

An objection that might be and, indeed, has already been urged to these conclusions is, that while some of the cases of pyorrhœa might be considered as either the local expressions of a constitutional condition, or the sequence of a specific poison acting as a predisposing cause, yet a large percentage, it is claimed, cannot be so estimated. *The force of this objection must depend entirely upon what conditions are meant to be represented by the term pyorrhœa alveolaris.*

In a former communication an attempt was made to differentiate two distinct diseases of the pericemental membrane, both of which were caused by the deposition of salts. In this short paper I desire to recognize the fact that we have *three* distinct conditions, quite easily differentiated, which it appears are not infrequently—indeed, are generally—classed under the same heading, "Pyorrhœa Alveolaris." The *first* may be noted as inflammation and destruction of the gum-tissue and the pericemental membrane, with solution of the alveolar process,—this the result of a mechanical irritant, the salivary calculus. This may or may not be accompanied by a flow of pus. If the pus be present, it is dependent upon some constitutional predisposition such as a scorbutic or scrofula habit. *Second.* Inflammation of the gingival borders with a varying flow of pus, but without the presence of tartar,—phagedenic gingivitis and pericementitis,—so designated by Dr. Black. This is greatly exalted, if not wholly caused, by some morbid constitutional state, which is also a destructive process. *Third.* Alveolo-cemental irritation originating at or near the apical extremity of the root, and due to some morbid composite of the blood exuded with the plasma, a salt or salts, infiltrating this locality of the membrane and *usually* becoming precipitated upon the root of the tooth near the apex; this latter I designate true pyorrhœa alve-

olaris, or hæmatogenic pericementitis. It is accompanied by accumulation and flow of pus, by denudation of a portion, or all, of the root, by dissolution of the process, by turgescence of the gum, and in certain stages with considerable pain. This inflammatory condition, with its concomitants, being so invariably associated with some recognized manifestation of a gouty diathesis, there appears to be full warrant for stating that it is but another local expression of that systemic condition. Confirmation of this assumption is found in the fact that this accumulation which is so frequently recognized upon the root near its apical extremity has by analysis been proved to consist of such foreign bodies as sodic urate, calcic urate, and free uric acid crystals. Nor is the presence of these salts the only evidence of the correctness of this theory. Cases which have been locally treated for months, indeed for years, with only a very limited perceptible improvement, have, when the patient has been subjected to constitutional treatment in addition, responded promptly; the inflammatory conditions, with their progressive concomitants, pus and process absorption, subsiding in a great degree. It is a matter of almost daily occurrence and observation, that a chronic latent inflammation of the pericementum may undergo an exacerbation from mechanical or atmospherical causes from the accumulation of the product of decomposition in the tooth, which may be followed by the formation of pus. This form of pericementitis may be of long or short duration, but in most every instance it yields promptly to local treatment. Now, although this inflammation be attended with a flow of pus and much suffering, it is in no wise a specific inflammation, and frequently occurs in individuals in whom no trace of a gouty tendency could be detected. And when the train of symptoms of such an inflammation are contrasted with those of the disease with which all are familiar, and which is known, or has been known, as Riggs's disease and pyorrhœa alveolaris, there can be no doubt that two distinct conditions are to be diagnosticated and treated. It is conceivable, however, that a local, non-specific, easily controlled pericementitis might, by the deposition of uric acid, become a specific, persisting, and destructive pericementitis. It is then this phase of the disease, whether *primary* or *secondary*, to which is applied the term hæmatogenic, and which is to be regarded as a local manifestation of a constitutional condition.

In the remaining moments devoted to this paper an effort will be made to outline a course of treatment based wholly on the supposition that in its etiology and pathology pyorrhœa as above de-

fined is but one of the multiform phases of the uric-acid diathesis. This, then, very naturally resolves itself into both local and constitutional treatment; the local directed towards the removal of the deposit, and the control or suppression of the inflammation and its concomitants. The method by which this is accomplished has been so frequently described and discussed that further amplification of it in this place seems unnecessary. There is, however, one factor which might be regarded as protective or prophylactic, and, though local, is of considerable moment and deserving of more than a passing notice,—I allude to the exercise of care in the avoidance of injuries to the pericemental membrane. Whatever the predisposing cause may be, the immediate or exciting cause must ever be borne in mind. This, it is believed, to a certain extent at least, is found in all those mechanical agencies so well known to the dentist, which impair or lower the nutritional level of the pericementum, thus rendering it liable, under certain systemic conditions, to a deposition of uratic salts. The question has been raised as to why the membrane of one or more teeth widely separated or occupying positions on opposite sides of the mouth, either simultaneously or successively, become the seat of inflammation when there is no continuity of structure; the answer to this must be found in the fact that impaired nutrition and lowered vitality in such structures are due in the majority of instances to mechanical injury. It is certainly within the experience of many observant dentists that pyorrhœa has not infrequently developed around a tooth after it has been subjected to the necessary mechanical manipulations incident to tooth protection—tooth preservation. This apparent interference with the nutrition of the pericemental membrane before the deposit of uric-acid salts takes place is in accordance with what is believed to hold true for other manifestations of the gouty diathesis. It is generally conceded by pathologists that no tissue becomes the seat of any specific inflammation without some previous alteration in its nutrition, which renders it more or less vulnerable to the morbid agent circulating in the blood. It is well known that this is especially true of acute gout. All the parts exposed to strain, pressure, blows, contusions, etc., such as the joints of the feet and hands, are particularly liable to become the seat of the specific deposit. As a prophylactic measure, therefore, it is suggested that whenever there is the slightest tendency to pyorrhœa, or any other evidence of the gouty diathesis, great care should be exercised in all dental operations, so as not to impair the nutrition of the peridontium and thus establish the necessary condition for the uric-acid deposit. The

constitutional treatment which has been indicated as efficient in the elimination of already established uric-acid conditions, and the restoration of a faulty nutrition to its normal state, may with great propriety be subdivided into hygienic and medicinal. The hygienic treatment embraces systematic out-door exercise, stimulation of the functional activity of the excretory organs, such as the skin, bowels, and kidneys, and regulation of the diet. Every dentist must appreciate the value of open air exercise, and if the welfare of the patient is to be considered paramount, it must be insisted upon in all well-marked cases, and especially with those who, for various reasons, lead sedentary and inactive lives.

Increased muscular activity quickens circulation, induces deeper and fuller respiratory movements, leads to greater vigor in the general nutritive processes; waste products are removed more rapidly, and the combustion of the foods increased by the absorption of a large amount of oxygen. The promotion of the functional activity of the eliminating organs is well recognized as an important hygienic measure.

My friend, Professor Brubaker, suggests that where there is need of hygienic treatment the secretory function of the perspiratory and sebaceous glands and the capillary circulation should all be stimulated by sponging of the skin with cold water, vigorous friction, and an occasional Turkish bath, where such treatment is not contraindicated by pulmonary or cardiac affections. And that where the liver and intestinal glands are deficient in secretion with prevailing constipation, they should be stimulated into activity by the use of saline waters; most excellent for this purpose being the Hunyadi Janos and Friedrickehalle. These, he says, are especially to be commended because they contain a large percentage of sodium and magnesium sulphates, both of which are useful as eliminating agents. The kidneys should be assisted in the excretion of waste products by the free use of negative waters, or waters in which the saline constituents are at a minimum quantity. Hot or distilled water in sufficient quantity will flush the alimentary canal, increase the volume of blood, and stimulate the kidneys to increased activity. It is not only of common observation, but rather a remarkable fact, that gouty patients are inclined to drink but a comparatively small quantity of water. One quart of hot water taken daily, in four doses, before breakfast, between meals, and at bed time, is considered most beneficial in its effects in dissolving and removing irritating products. The most important of the hygienic measures in the treatment of all gouty manifestations is that pertaining to the diet.

As uric acid is considered a nitrogenized compound, and therefore presumably one of the imperfectly oxidized products of albuminous or nitrogenized foods, it is desirable that such foods be excluded as far as possible from the daily diet. The value of this measure is admitted and insisted upon by all clinicians.

In the milder manifestations of the gouty diathesis, such as we assume exists in pyorrhœa, it is not so imperative that all albuminous foods be prohibited; nevertheless, as many of our patients are consumers of large quantities of meat, it would be well to insist, if the effort to cure is to be made, upon the total exclusion of beef, veal, mutton, and pork, restricting the patient in albuminous diet to white meat of chicken, fish, oysters, and lobsters. Cheese, beans, and the white of eggs are considered objectionable, and in many cases of acute gout are strictly prohibited by the attending physician. Experience has shown that various alcoholic drinks, such as port, madeira, and sherry, are particularly liable to give rise to the accumulation of uric acid. The lighter wines, as claret and hock, are not considered so injurious. The malt liquors,—beer, ale, and porter,—are also, with many clinicians, considered in their influence gross offenders.

If this assumption regarding pyorrhœa alveolaris be correct, the following, also furnished me by Professor Brubaker, is pertinent and applicable: The medical and constitutional treatment—it is obvious—should be directed towards the elimination of uric acid and its compounds. For this purpose remedies which promote the formation of soluble and easily diffusible products which are readily eliminated by the kidneys are indicated. From time immemorial the alkalies and alkaline combinations have been used with marked success in the management of all phases of the gouty diathesis. The treatment of acute gout necessitates, of course, different or more vigorous remedies than those required for the subacute or chronic forms with which the dental practitioners will be called upon to deal. Of the various alkalies, lithium compounds—the citrate and carbonate—have been found best adapted to the milder phases of the disease. The form most easily to take is the compressed tablets containing five grains each of the citrate; one tablet three or four times daily will be found sufficient. Should this not agree with the patient, the potassium carbonate in ten-grain doses, in some simple bitter,—gentian or quassia water,—three or four times daily, can be substituted. A valuable adjunct to the medicinal treatment is the free use of alkaline waters, which assist in the elimination of waste products, though it is probable that the good

effects attributed to these are largely due to the quantity of liquid consumed. The Saratoga, Vichy, alkaline waters of Wisconsin, the Marienbad, Carlsbad, Appolinaris, etc., have all been found efficacious. Should the patient be highly dyspeptic, as is frequently the case, remedies directed to the digestive viscera are of course indicated. If anæmia be a concomitant, iron and quinine will be necessary. A combination which has been found of great value in improving the quality of the blood is one of iron and a salt of potassium. Blaud's pill, consisting of these two ingredients, is a desirable form for administration; one three times a day will be sufficient. However ingenious our interpretation of pathological conditions may be, and however plausible our deductions may appear, the ultimate test of their value will be the readiness with which they yield to and disappear under appropriate treatment. If pyorrhæa alveolaris be a manifestation of the gouty diathesis, and the symptoms and pathological conditions which characterize it be excited and maintained by the deposit and pressure of uric acid and its salts, it should be amenable to the same therapeutic measures which have been efficacious in the treatment of all other forms of gout in other portions of the body. It must be borne in mind, however, that though a case be cured for a period of six months, or even a year, this does not preclude a relapse should the patient return to an improper diet or irregular mode of life. It is hardly necessary to say that this is true of all chronic diseases. In individuals predisposed to uric-acid accumulations, an entirely new mode of life is to be instituted and followed with extreme care for a long period of time.

As corroborative, however, of the facts which have been adduced in this and previous papers, in relation to age, occupation, heredity, constitutional condition, as well as the effects of treatment, I append the history of a few cases which may be of interest.

Case I.—Mr. A., aged forty-five. Family history: father died early from consumption; mother rheumatic; has lost nearly all her molars from pyorrhœa, which she has had for many years. The patient has been suffering from pyorrhœa for six or eight years. For nearly three years he has been under my care, his visits being monthly. Though not a tooth has been lost, the thirty-two have been the seat of well-defined pyorrhœa; gums œdematous, with veins engorged, giving a purplish color. Notwithstanding the continued local treatment, the most that can be said as to the benefit derived from this is, that the disease did not progress, nor did it materially improve, save some abatement in the inflammatory condition of the gums. As an evidence of a gouty constitution the

patient had suffered with neuralgic headaches, vague rheumatic pains, and great mental depression. Several years ago he was informed by a distinguished clinician that the heart was depressed in its action from nitrogenized waste products. The patient admitted having largely confined his diet to meats. After, now, a little over three months' treatment, embracing restricted diet and the use of lithium and hot water, the discharge of pus has ceased from all the teeth except one third molar. The loosened teeth have become much firmer, the turgid condition of the gums has disappeared, and the gingival borders present a much more normal appearance. The patient on his last visit stated that mastication was performed without fear of dislodging the teeth.

Case II.—Mrs. B., aged fifty-five. Family history, gouty; one sister almost disabled from deposits in joints of hands, feet, and limbs; another sister has lost by erosion the enamel from the six anterior superior teeth. The patient has had pyorrhœa for eight or ten years, from which several teeth have been lost; ten others are now affected with looseness and some discharge of pus. The members of this family have been large consumers of meat. Treatment for two months with drinking hot water and modified diet gave improvement in flow of pus and inflammatory condition of gums.

Case III.—Mrs. C. Lost superior teeth from pyorrhœa; ten teeth remaining in lower jaw, all more or less affected with pyorrhœa. The patient has been under treatment for gout for some years,—all the joints of fingers enlarged and painful from gouty deposits. The forehead and face show the result of herpes from previous herpatic eruption, regarded as of gouty origin. Treatment was followed by improvement.

Without wearying you with details of similar cases, permit me to say that in addition to the three cases just noted, ten others have been, and are, under treatment, all of whom, with the exception of three school-teachers, have presented other manifestations of gout. In these three cases a sedentary life and concentrated nitrogenous food have probably been instrumental in establishing the systemic condition leading to pyorrhœa. It is gratifying to recognize the fact that cases which have been brought under treatment of the restricted diet and the indicated constitutional treatment have given such encouragement that it is not unreasonable to hope that, with a continuation of the therapeutic measures and careful diet, the not-distant future will witness such abatement of the destructive symptoms that the cases can, with few exceptions, be recorded as confirmatory of the theory suggested in the foregoing papers.

The writer can certainly state that the local treatment alone which had previously been employed by him has not yielded such satisfactory results.

DISCUSSION.

Dr. Brubaker, on being called upon by the President, said, "There is nothing, Mr. President, that I can add to the suggestions made by Dr. Peirce either in reference to individual or to dietetic treatment; both are based on the well-recognized lines of treatment long since found to be efficacious in the forms of the gouty diathesis. The question has been asked why only the meats are excluded from the anti-gout diet and not vegetables also, especially as some of the latter contain proteid matter in large amounts. The only answer that presents itself, is that the albuminous molecule of the vegetable foods is less complex and not so difficult of assimilation."

In answer to the question of Dr. Kirk as to what was the peculiarity of beans that they were excluded, Dr. Brubaker stated that it was largely on account of the percentage of proteid matter which they contain, and which amounts to 23.7 per cent., though it must be remembered that the proteid matter is not true albumen, but a globulin, and, therefore, not as objectionable as a more complex form of albumen.

Dr. Bonwill.—Before I speak upon this subject I wish to make some remarks upon a charge made at a recent meeting by one of the speakers, a guest of the Society, which, owing to my deafness, I did not hear. My views in the paper read were regarded as "elementary." I laid no claim to the matter therein contained as being scientific, but it comprised the substance of what I knew and practised. His remarks on that occasion were unauthorized and unbecoming.

I am not on record for having said one word upon the subject of this evening's essay, notwithstanding it has figured for at least twenty years as not only an incurable disease, but its cause has never been satisfactorily explained. My silence is not that I have had no subjects for treatment, nor that I have no views upon it worthy of notice.

I presume I have had about as varied a practice as any one here, and, while my opinion may be regarded as of little value, yet I certainly have some right, after an experience of nearly forty years, to an opinion. What I claim to know can be demonstrated, and the result of that experience can be shown in the living subjects. Many of us may not be so profound in chemistry—organic or inor-

ganic—as our essayist, yet with the assistance of others learned in the law of chemistry, we may reach nearer to a satisfactory explanation. I am no chemist, and few, if any, of our clan practically know any more.

It is possible that some persons who are troubled with pyorrhœa (I retain the old nomenclature as good enough for me) have gouty diathesis. It may be I do not know the symptoms of gout. There is one thing I do know, however, that when I can take the many cases that have come to me from the practice of the so-called best men in our profession, who have given them up and declared that no one could save such teeth, and restore those teeth to usefulness without constitutional treatment, and have only seen them twice or thrice at most, the gout has not been in my way. If it be a disease, then every part of the membrane should show it and the deposit take place from the very apex of the root; or, more properly, all portions of the tooth's membranous structure simultaneously should be involved. I have yet to see the first tooth where a deposit has been found at the apex or on any portion of the root without the loss first of the membrane at the cervix. Any one who will with exploring needle search each case will see that when a secretion is pouring forth from about the cervix, accumulations of calculus will be found only on the parts where there is no healthy attachment of the investing membranes.

I can understand how the gouty diathesis can be a factor by depositing surplus calcareous salts found in the blood in the mouth, through the numerous glands emptying thereinto, and mixing with the large amount of starchy matter from the food and the mucous secretion from the gums, as the formation of calculi in the gall-ducts and bladder, but never as a predisposing or exciting cause of pyorrhœa. That there is a surplus of uric acid in the blood of gouty patients admits of no conjecture, as I have detected its peculiar odor in the breath and when drilling into the pulp-canal to relieve pus accumulations. If it should occur at the apex first, then all pulps of such teeth would soon become involved, which is not true, however.

Hundreds of cases have I seen where one side of a root has been involved and stripped of its investments to the very apex, and the pulp at that extremity finally become affected and death ensue.

We often see one of three roots of an upper molar with accumulations, and have cut that entirely free from the others, and they never became affected. It is my opinion that no such accretion could be formed by either investing membrane.

Then you would ask how I treat all my cases; if there is any special way that gives me success where others have failed? First let me say, that in my original practice, or where I have had charge of any mouth from childhood, I do not know of any case where pyorrhœa has ever had a foothold and the teeth lost from such cause. I am aware that this is a bold assertion. But, when I can say that many who commenced with me years ago still make their appearance, some yearly, others not so often, I have no cause to regret what I have done.

Before I speak of the treatment, let me call attention to one factor that has never been noticed, so far as I have kept up with the literature of the subject. False articulation has much to do with the cause. The extraction of one or more teeth early in life makes such a change in the relation of the whole denture that the lateral and direct force brought to bear upon one and all, especially the molars and bicuspids, causes the investing membrane to be unduly forced or strained and its function materially lost. The extraction of the first permanent molar in the lower jaw causes absorption of a large portion of the alveolar process on the roots of the adjoining teeth and the gum still in place, yet loose about the cervix, and for half an inch under, where accumulations are found long before any other place, and from this the teeth adjacent are involved. But this is little, indeed, when the whole denture is thrown out of gear, as cog-wheels become by wear and change of relationship. The best evidence I can give of this fact is, that before I resort to any treatment, I invariably look at the articulation and take an impression of both jaws and place them in my articulator, which reveals just what I see in the mouth,—the teeth most at fault.

So long as this is allowed to remain, no cure can ever be affected. Take off the calculus, and still this cause remains to condemn you for your want of vision. As soon as one tooth becomes involved more than another, the offender is at once thrown from the socket and articulation is thrown largely on this one and its antagonists, and the disease becomes magnified until the tooth is lost. Could you have seen this, and with your engine and corundum wheel have placed this tooth and its opponent in harmony, as you would shove a cog out of place, or one that is loose tighten and make shorter, every time there would have been perfect success. I have often seen cases given up as hopeless by others, when by simply rearticulating them, they have been restored to perfect health for years and with no loss or extension of the disease to other healthy teeth.

So often in mouths where the teeth are far beyond the average, and scarcely a decay to be found in any of them, have I had to combat with loose teeth; not the whole set, but an individual tooth and its antagonists. On questioning the patient I have found that biting off threads or the finger-nails produce the effect of sharper articulation. I simply shorten these teeth, so that they cannot longer use them, and all is well.

A few weeks ago I had a patient whose teeth were given up. They were almost faultless and placed in the process firmly as rocks, save three or four. She told me on inquiry that it was her habit to crush ice between those teeth, and she could not think she was injuring them, and her dentist never asked her as to what she was doing with her teeth. One, or perhaps two, I made her lose. She had very little tartar upon any of them, not even upon those extracted.

Take another case: A man who had lost nearly all his bicuspids and molars, except where it was hit and miss, and of no value for articulation, came to me with the left lateral incisor, lower jaw, so tender that cold no longer affected it, but hot water gave intense pain. It had been this way several days. My first thought was the pulp is involved; but there was no decay. Then I looked after the articulation, and I found that nearly or quite all the incising and even grinding was done upon this one tooth and the two upper antagonists, that were much larger and fared better. The first treatment suggested to me was to drill into the pulp-canal and remove the congested membrane. But I simply cut from the labial surface of the inferior lateral and the lingual surfaces of the superior antagonists, and the pressure was instantly relieved; and without even a counter-irritant the tooth began at once to improve, and from that time was no longer a cause of irritation. There was no accumulation on it.

To further illustrate how far false articulation is a factor in the loss of good teeth, some with loads of tartar on them and others none, I will recall a case of a desperate drunkard who had been my patient for years, and there never were any signs of loosening of the teeth and no previous signs of tartar or calculi. In one of his fits he caught foul an inferior lateral incisor, right side, and in the spasm of his jaw fractured the process on the lingual side. When he came to me for treatment, three weeks after, there were already accumulations taking place on the root, and the crown was quite out of its place and was struck at every motion of the lower jaw. At this time pus was pouring out from every surface, and no short-

ening of the crown and ligating would retain it and cause it to grow firm again. I had to remove it. There can come a shock to every tissue, bony or soft, that means death whether the system is in health or not. But the bulk of such cases can be saved by regarding articulation and very little interference on the part of the surgeon.

I could multiply these cases and their cures. One more, however, I must notice. One of the upper classes came to me eight years ago in great trepidation. He informed me he had been to not only four or more of the so-called best dentists of Philadelphia, but to prominent physicians and surgeons, and each and all decided there was no treatment which would reclaim those remaining, but one by one they would leave him.

His teeth were as nearly perfect as anything I ever saw,—only one filling of oxyphosphate, and it was to cap a pulp, which was one of those he lost. Two molars in the lower left side and one in the upper, same side, I refused to treat at all. The rest I cleansed, which was done at one sitting, having him two successive sittings to see if any small particles remained and to complete the articulation of those thrown out of position; and that mouth stands today as I left it. He comes to me every year, and it requires but one sitting. This gentleman from high living should have been gouty. But, if he was, it did not interfere with the treatment.

Allow me to speak now of another factor which dentists will be reluctant to admit. You may not have thought that bad dentistry has anything to do with this trouble. Well, I am sure it has. If gout has so much to do with this frightful disease, how is it I can take a mouth filled with flat approximal fillings leaving at least twenty spaces between the teeth, and then by keeping them all apart with pink gutta-percha until a proper width is attained, the whole jaw becomes at once easy and quiet, and the teeth again assume their normal position in articulation with their antagonists.

Finally, as the spaces are wide enough to permit the alveolus and gum to get and retain their normal status, I make contour fillings that buckle up to each other so that no food can possibly pass. Try what I say, and you can do what others have not done. I see contour work, but when it is investigated the teeth were once cut away and allowed to come together; and, instead of taking time to force them apart with the gutta-percha and let the teeth assume of themselves normal articulation, a separator is placed in and they are filled at once, and the gum and process are left pinched and will never be as healthy and firm as when wide apart; besides, the

crown fails to assume the normal articulation. Again, when these ground arches are broken into by extraction, the teeth are never so firmly in contact as to prevent food from being driven between them and causing irritation and accumulations, as well as irritation from undue pressure. The teeth will stand an immense deal of abuse, as bad dentistry will testify; but modern life with its soft food and sweets, with no true legitimate work given to the teeth, weakens the tissues and causes absorption of alveolus and makes the teeth loose, and the gums will not close round them any longer, and secretion will accumulate and pyorrhœa step in, but not true disease. Lastly, artificial teeth are no mean factors in causing destruction to the remaining teeth. Look at the bad-fitting plates with their borders allowed to come in direct contact with the cervix of every tooth, for fear it will not be retained; sharp edges to irritate and loosen the teeth in contact. And with bad articulation they are more an apology for a substitute than a realistic set. They do not relieve the work to be done on the few remaining teeth, but force them out of position and cause weakening of the tissues surrounding.

Look at the mischief that crowning does with a band as an irritant in so many cases, and this extending to others causing secretion to accrue, and finally loss. When properly done and the teeth wedged tightly in, they are a salvation; and how many cases of loose roots can be restored to firmness if well done by crowning, by giving them work to do. See how much mischief is done to the gum-tissue that spreads far and wide from the use of arsenic on the pulps. I will not multiply cases that I know to be factors in this dreaded disease. Have well-adapted instruments and keep them sharp. Use a dull bur in the engine. Do not be afraid of hurting the patient, fearing they may not return. Take the bulk of secretion off at the first sitting, and be sure of it. Cut all loose and excess of gum down to healthy tissue, or rather sound borders, leaving no cause for deposits. It is worse than useless to allow it to bag around the cervix. Make the gums irritable, and they will grow stronger and grasp their fellows with firmness. Use carbolic acid, creosote, or anything that will act as an escharotic, and burn the dead tissue of the membranes. Have the patient come back in one week, and you can tell if any secretion remains. Remove at once and not disturb the healing tissues. I told you first of all, restore the articulation. Let the parts heal in their own blood, and do not interfere every day with nature.

In other words, imagine you have a fistula to treat. You know

the walls will not come together and heal unless they are excoriated and freshened with the scalpel or an escharotic; and so here don't be afraid of tearing the membranes off the tooth or the investment. If I can put the actual cautery there, so much the better. Look on the space between tooth and alveolar border as a narrow fistula. And when clean and well burnt out, it will be sure to heal. If the surface of root at any point is rough, bur it off, and also the dead or lifeless alveolus. I have never cut too much, but frequently too little. The treatment to be given them after leaving you is simple. No washes even. Simple tooth-soap, with the finest pumice in it, is all I use. As small a tooth-brush as is to be had and with not more than three rows of bristles lengthwise, and the whole brush not over one inch long, or an inch and a quarter. One minute brushing immediately after eating. Not more. Never use the brush across, nor up and down, but put it in one place and press down upon the teeth and wriggle it around, keeping it pressed between the teeth.

A small brush requires less pressure to work in between the teeth when the bristles are far apart. Have the patient see you at least every six months, and then do not unnecessarily cut the gums loose, but gently run a scaler around and let them go.

Last, and not least, a tooth-pick. What kind? Never a wooden one of any shape or fibre. They drive the gum up and away from the cervix and keep it forever loose for secretions to embed there. A quill is better than all else, except a very narrow, thin, and long gold one.

In the use of the silk floss charge them not to "see-saw" with it and keep the gums always cut away from the cervix. It does immense mischief to the gums. Pardon me for this lengthy discussion. As I have never said anything before upon it, I say now and for all time, I am satisfied as to the simple treatment of common sense and have no cause to regret the past, and see none why I should change it for all the theories and conjectures of professors or chemists.

Dr. Broomell.—I became so interested after listening to the discussion at our last meeting, that I resolved upon making an investigation myself. Since that time I have made it a part of my daily practice to question those patients in whose mouths I noticed the least inclination to pyorrhœa. The result has been that out of ten patients whom I questioned, all but two reported a rheumatic or gouty diathesis. Two of the cases were especially interesting to me, from the fact that they represented the two extremes in the habits of life and in the manner of living. The first one, a lady,

about fifty-five years of age, was a "high liver" in every sense of the term. Entertaining and being entertained, breakfasts, dinners, and teas following each other in rapid succession, partaking most generously of everything that would please the palate and lighten the heart.

This much of her history was given to me without my having to ask for the information. Upon examining her mouth, I discovered aggravated pyorrhœa about several of her teeth. When I inquired into her general health, she informed me that she was a terrible sufferer from rheumatism, gout, and heart-disease. I also learned that her father had suffered in the same manner, and had lost all his teeth prior to his death, no doubt from pyorrhœa, by the description given me by my patient. Upon examining the smaller articulations, there appeared to be no indications of chalky deposits. This patient, I should think, would be a powerful witness as to the correctness of Professor Peirce's theory.

The other case, a Mrs. H., aged fifty-eight, represented a typical subject of the other extreme. Being a strict vegetarian, she declared that neither she nor her parents before her had ever partaken of animal food, shunning all meats, fowls, game, fish, butter, eggs, milk, and spirits. She had been taught, and in turn was teaching her children, to do all that could be done to redeem fallen humanity. For her, olive oil took the place of butter and lard. Her hands could not withstand the irritation produced by wearing kid gloves. The shoes upon her feet were for the greater part constructed from vegetable products, while bone buttons upon the clothing could never be tolerated. To further show me the regard she had for her belief, she has forwarded me a number of bills of fare at the vegetarian restaurant at which she dines when abroad. If, as I understand it, uric acid is produced by animal food, and pyorrhœa is produced by uric acid, this case appears to be somewhat mysterious. Pyorrhœa existed to a considerable extent. The finger-joints were abnormally enlarged, and the complexion, which one would think should be clear and spotless, was wonderfully imperfect.

What, then, can be the conclusion when we find pyorrhœa in two subjects so extremely different.

The President next asked Dr. Brubaker to tell the Society about gout and gouty diathesis in the matter of cases of pyorrhœa.

Dr. Brubaker.—Mr. President, it would be impossible in the short time at my disposal to discuss adequately the causation or pathology of gout and its relation to pyorrhœa. As I am, however, to a slight extent, responsible for some of the statements in Dr. Peirce's

paper, I will take the opportunity of replying to some of the criticisms which have been made to those statements and which may have a bearing on the pathology of gout and pyorrhœa.

Notwithstanding all the theories which have been propounded from time to time by pathologists as to the cause and pathology of gout, there is yet much difference of opinion; but as to one factor most observers are in accord,—viz., that the underlying cause is the presence in the blood and tissues of uric acid. Inasmuch as phenomena of general gout are so extensive and complex, it has been deemed necessary by some pathologists to invoke the aid of other factors. Dr. Duckworth, for instance, has been at great pains to illustrate the influence of the nervous system in the production of some of the curious phenomena. Nevertheless, this eminent authority states that while "the peculiarly presented relations of uric acid, even in true gout, do not constitute the whole of the disorder," yet, "in spite of teachings to the contrary, I would affirm at the outset that this part of the pathogeny of gout is certain, so that it may be plainly stated, 'no uric acid, no gout.' I would express my adherence to the view that the most unequivocal evidence of true gouty disease is that derived from the presence of uratic salts in the tissues." (A treatise on gout, p. 15.) A statement was made this evening that the uric-acid diathesis and the gouty diathesis are not synonymous terms. This distinction may be made, but in view of the statements of Dr. Duckworth just alluded to, it is hardly tenable. It is true that uric acid may exist in the blood without giving rise to any particular gouty manifestations that can be recognized, but it must be admitted that in the vast majority of instances there is a close relation between that type of disordered nutrition known as the uric-acid diathesis and that type of constitution known as the gouty.

It has also been asserted here that gouty attacks can be produced without uric acid being present, at least in excess. This is exceedingly doubtful. This idea originated with Dr. Todd many years ago, but it has never received much confirmation.

One of the speakers this evening, Dr. Allan, quoting from an article in Pepper's "System of Medicine," vol. ii., said that the distinguished writer entertained the idea that uric acid is not the cause of gout. Yet an attentive reading of the article *in extenso* will reveal the fact that the writer regards uric acid as the most constant and important factor in gout production, though he does state that it does not explain all the phenomena. The treatment, both medicinal and dietetic, is based on the view that uric acid is largely the ex-

citing cause. An apparent contradiction to the views of Dr. Peirce that a highly nitrogenized animal diet is a necessary antecedent of the uric-acid diathesis, was offered by Dr. Broomell,—viz., that pyorrhœa is seen in vegetarians and in those who consume but small quantity of meat. This is, indeed, true. But it must be remembered that uric acid may arise from a disintegration of the proteids of the tissues, as well as from an imperfect assimilation of the proteids of the food. And if there is an excess of proteids in the vegetable foods or a defective power of elimination of waste products by the kidneys, it is conceivable that uric acid, one of the products, might be retained in the blood and give rise to the characteristic phenomena.

Again, the chemical analysis of the deposit has been called in question, and it has been asserted that no uric acid, or but little, is present in any given deposit. This is no doubt true in some instances. It must be remembered that in aggravated cases of pyorrhœa there is a continual discharge of pus, and the uric-acid salts are carried away with it. It is not to be expected, therefore, upon the removal of a tooth to find large masses of pure uric acid. The deposit from any tooth is largely composed of an albuminous basis, which, upon the addition of nitric acid, becomes of a bright yellow color. This often obscures to a marked extent the color of the murexide test. The albumen also interferes with the crystalization of the uric acid. Again, care and patience must be exercised in examining the deposit for uric acid. In an analysis made to-day, two hours were occupied with one specimen, from a few grains of which eight crystals of uric acid were obtained. This may not be very striking, but it is sufficient to indicate its character.

Another objection that was made was that pyorrhœa patients are not gouty patients. The value of this statement will depend upon the knowledge and experience which we as individual practitioners have had of determining that fact. How many practitioners here would have been able to diagnose the gouty character of the disordered heart in the first case alluded to by Dr. Peirce? Yet this was done by a most distinguished clinician in this city, and had the patient followed the course of treatment suggested, it is quite likely he would never have had pyorrhœa.

The view first enunciated by Dr. Peirce as to the pathology of pyorrhœa, as published in the International Dental Journal for January, 1894, may or may not be true; but there is a strong supposition that it is, and the truth of that supposition can be de-

termined by the result of treatment. If these pyorrhœa patients get well on an anti-gout treatment, it is presumptive evidence that they were gouty and the pericementitis but a local manifestation.

Dr. G. S. Allan.—I have listened to this paper with exceeding interest. I hoped to get some new points; I haven't got any, except as to treatment, which was general and indicated in Dr. Peirce's former paper. I confess I feel a great deal as if I had been in fairy-land, and that I had listened to some particulars of a disease of which, so far, in my own practice, I had known little or nothing about. The statements in that paper, if uncontradicted, would go to prove that the profession heretofore had practically no knowledge of what pyorrhœa alveolaris was and no knowledge as to its etiology, and that the treatment heretofore on the lines that had been adopted ought to have been, if they have not been, futile and unavailing.

I questioned the accuracy of Dr. Peirce's statements and conclusions. First, on the ground that the presence of uric acid in the system, or uric salts, did not indicate gouty diathesis. I quoted from Pepper's "System of Medicine" an article by Dr. Draper on Gout, strongly taking up the position that I had held. I also read a quotation from the *American Journal of Medical Sciences* from a later writer, taking identically the same position. To-day I called upon my old friend, Dr. Thomas Morton, of Philadelphia, and I asked him the same question. He corroborated my position and statements, and when I asked him if I could quote him, he said, "Certainly;" which I now take the liberty of doing.

Taking it for granted there is anything in this theory,—which I doubt,—there are no proofs that the uric-acid and the gouty diathesis can be considered as one and the same, but Dr. Peirce used the two terms almost synonymously. I stated before that you could have gout without uric acid in the system, and you could have uric acid in the system and no gout; and I believe my statements can be well borne out by the evidence of able practitioners.

In a paper I read before the combined societies of New Jersey and Pennsylvania at Asbury Park a few years ago, I made this statement, that if a practitioner had charge of a patient's teeth, and the patient was conscientious and carried out directions fully and as indicated, it was inexcusable that pyorrhœa alveolaris should have its origin in that mouth, and certainly inexcusable that any destructive work should be done by the disease. That statement I still adhere to; and in that statement I absolutely ignored any such thing as constitutional treatment. In the analyses that I

had made of this hæmatogenic calcic deposit, absolutely nothing but a trace, and a trace only, of uric acid was found in that deposit. Now, that is significant. In these analyses that Dr. Peirce has made, the doctor draws attention to the uric acid found in minute quantities only, ignoring the fact that the great bulk of these deposits are calcium phosphate and calcium carbonate. In none of the analyses heretofore made has uric acid ever been recognized, nor was the presence of uric acid in these deposits ever suspected till Dr. Peirce made his report. Now he comes forward and his analyses seem to prove that uric acid is a predominant element. I don't believe that a quantitative analysis made of this hæmatogenic calcic deposit would have shown anything more than a mere trace of uric acid, and this I say because I have the results of the analysis Professor Ricketts made, and from such a large quantity of the material, and failed to find anything but a mere trace.

Another point I made, and that was that after the deposit had been formed no constitutional treatment could take up that deposit, carry it back into the blood-current, and have it eliminated through the ordinary excretory channels. Now, there is no such thing,—there can be no such thing,—from the very nature of the case. Here is a deposit, hard and insoluble, deposited against the root of the tooth. The blood cannot get at it in any way whatever, and I cannot conceive the possibility of any constitutional treatment removing that deposit. The mere statement of the conditions makes the impossibility self-evident. But supposing a good portion of that deposit, as Dr. Peirce indicates, is composed of urates, those urates are still simply mechanical irritants, situated as they are. They are in a place where they act mechanically, and mechanically only; and I maintain that all this train of hæmatogenic calcic pericementitis symptoms comes from the irritating effects of the deposit acting locally."

Dr. Kirk.—How came the deposit there?

Dr. Allan.—I never denied that a constitutional condition was at the bottom of the deposit. But that is one thing; the disease itself is another. As I stated, the stone in the bladder or in the urinary ducts comes from some constitutional condition; but when it is in that position, then it starts in business for itself, and all the inflammatory conditions that follow are due to the deposit and not to the constitutional diathesis or condition of the system that produced the deposit. With every desire to do so, I fail to see what point or what bearing this theory will have upon the treatment of pyorrhœa alveolaris, and for these reasons; summing it up, it is just

this: Uric acid is not a necessary concomitant of gout or rheumatism; and, granting even that it is, the train of symptoms we have are local manifestations of a local irritant. I do not deny—I never have denied—that there are cases of pyorrhœa alveolaris that, so far as we know, are not caused or produced by a deposit of any kind. I have had such cases in my own practice more than once. I could not account for them, but that does not prove that the great majority of the cases are not produced by this hæmatogenic calcic deposit.

Since I was here last month I made it a habit of asking almost every patient whether they had pyorrhœa or not; have you gout or rheumatism? Tabulated and put into shape for drawing deductions, I find that the results are worse than conclusions. In other words, gouty patients had no pyorrhœa, and patients that had no gout or rheumatism had pyorrhœa, and the significance of the gouty diathesis was simply visionary.

There is a difference between a deposit made in a tissue and one outside of a tissue. The deposit that is on the tooth is outside of the tissue, not inside. It is not, so far as we know, in the peridental membrane. It is a deposit on the exposed surface of the root of the tooth, being deposited on the surface of the root only. Outside of any possible influence the blood may have, I don't see how constitutional treatment can absorb or in any way dispose of that uric-acid deposit.

Where there is death of the periosteum and we have a deposit on the denuded surface of the bone, I do not see how any constitutional treatment would be available for removing the deposit. If Professor Peirce's theory be correct, he has not made it plain, if this deposit takes place in the pericemental membrane, how it is transferred from the pericemental membrane, dead or living, on to the surface of the root of the tooth where we find it.

Dr. McQuillan inquired of Dr. Allan if, in speaking of treating pyorrhœa, he meant that a cure was effected, or whether it is simply the arrest of the disease. Dr. McQuillan acknowledged that he could not cure it.

Dr. Allan.—I will answer Dr. McQuillan by referring him to my paper, in which I said that I could not do it, except in some cases. If the disease is taken in its earlier stages a cure can be effected, but when it has passed beyond what we call the earlier stages, it seems all we can do is to alleviate the consequences; but to make a radical cure in a pronounced case where any quantity of the peridentium has been destroyed, I think most difficult. We can

save the tooth for a long time, but that does not cure it. That is arresting it.

Dr. Truman.—I desire simply to say that I have cured exactly such cases; cured them perfectly and kept them there.

Dr. Kirk.—Allow me to make an explanation. Since the reading of Dr. Peirce's paper at the last meeting, I have been employing all my spare time in making some chemical investigations of these deposits, and the first tests I made were all from cases carefully selected with reference to their possible gouty association.

There is one factor which will necessarily modify the results which one may get from a test of these deposits, and that is the question of quantity. The quantity of material at our disposal in any single case is, necessarily, extremely small. I have examined some seven or eight specimens secured from mouths which had a definite gouty history. The first three of these I put through a series of careful tests and got some slight reaction, but one which I would not like to take into court as definitely showing uric acid. The other cases were those in which I had larger deposits, and were treated not only by the usual test, but they were carefully tested from every stand-point possible, in order to determine whether they did or did not contain uric acid, and I found that they did contain uric acid. In these several specimens there was a marked difference in the character of the deposits.

Some of them were extremely adherent, and were such as Dr. Allan has alluded to as being in close contact with the cementum. I believe they were in close physical union with the cementum of the tooth, with no pericemental membrane intervening. I had two cases, however, in which the deposit was, as nearly as I could determine by the unaided eye, located in the pericemental membrane, because the deposit easily peeled off with a small strip of the membrane adhering to it, showing it was situated in the enveloping membrane of the root. These two cases gave the most marked reaction for uric acid. It was not a haphazard difference, but a very marked one both as to quantity and intensity. It seems to me possible, in fact, highly probable, that deposits in close organic connection with the cementum, and in which the pericemental membrane has been destroyed, are those which mark a later stage of the disorder. The two cases of which I speak, in which the uric deposit existed only in the pericemental membrane, had not gone on so far, because the deposit of serumal tartar was relatively slight in quantity, with urates in relatively greater proportion.

I want to state also that all the deposits I examined, with the

exception of the two in the membrane, consisted essentially of phosphate of lime, and that the uric acid was small in amount. In this relation let me call attention to the analogy which these deposits present to vesical and renal calculi. Cranstoun Charles quotes Thudicum as stating that in nearly all of the vesical and renal calculi examined, of those which contained uric acid, it existed as a nucleus around which the calcium phosphate had been deposited in connection with the organic matrix, and existed in layers concentrically arranged. I believe it is well recognized that all vesical and other calculi must have, or are likely to have, some nucleus around which the deposit takes place, and in many this nucleus was found to have been uric acid. The chemical and physical conditions are such that we might reasonably expect the same chemical and structural features in the deposits of serumal tartar.

Dr. Guilford inquired how the deposition found in the membrane could afterwards be transferred to the cementum.

Dr. Kirk.—I do not know that it would, except by production of inflammatory action. A denuded area of cementum would itself be a source of irritation, and the irritation would invite further deposits. I should look upon the deposit in the membrane as precedent to the deposit on the root.

It seems to me that some confusion has arisen in this discussion from the failure to clearly distinguish between the exciting cause of pyorrhœa, which is undoubtedly the deposit, and the predisposing cause which gives rise to the deposit, which Dr. Peirce believes to be the uric-acid diathesis. This seems to me to be correct and logical reasoning, in view of the facts respecting the character of the deposit and the results of specific systemic treatment. Local treatment alone will not cure the disorder; if we hope to prevent recurrence, we must remove the predisposing cause.

Dr. Bonwill.—I wish to correct a statement I made in my paper, to the effect that constitutional treatment should never be used. At least one in every two persons has some derangement of the gastric function, which leads to other troubles. Instead of giving remedies, keep the stomach all right by proper food; never drink when eating. That is all the treatment I would give. That is constitutional. Give the food in a proper way.

I would propose as the best way of reaching this thing, that we have clinics, and that Professor Peirce shall bring his subjects and let us see whether or not we understand what pyorrhœa is. I don't believe I do. I want to find out, and that is the way to get at it.

Dr. Peirce.—My friend, Dr. Allan, placed words in my mouth on two occasions, words that I do not recollect having uttered in my paper or verbally, and that is that I maintain that I induce the absorption of the deposit or the removal of the deposit by constitutional treatment. In every instance where I have spoken of the treatment of pyorrhœa, I have said emphatically that an instrument for removing the deposit was essential. In every case I make that the starting-point, and follow that up by the application of acid carefully applied; and wherever I have spoken of it, I have made that emphatically the beginning of my treatment, and have only contended that in constitutional treatment I facilitate the process of healing. I have not been successful in curing beyond recurrence, but I have been more successful in the last four months, since I used constitutional treatment, than I ever have been before in cases that I have had in hand four or five years and seeing the patients during that time almost monthly.

Dr. Allan replied that he had probably misunderstood the paper.

Adjourned.

THE regular monthly meeting of the Odontological Society of Pennsylvania was held April 14, 1894, at 1228 Walnut Street, Philadelphia, the President, Dr. E. T. Darby, in the chair.

After the transaction of routine business the essayist of the evening, Dr. I. N. Broomell, read his paper on "Metallic *versus* Plastic Base for Artificial Dentures."

METALLIC *VERSUS* THE PLASTIC BASE FOR ARTIFICIAL DENTURES.

BY I. NORMAN BROOMELL, D.D.S., PHILADELPHIA.

WHILE the reputation of the dental profession in general has been gradually advancing in regard to their knowledge of therapeutics, and in the treatment of oral diseases, together with a still greater advancement in all operations upon the natural teeth, there has not been a corresponding progress in prosthetic dentistry. The existence of this condition will hardly be denied, therefore the acceptance of its truth naturally leads us to inquire into the causes producing it.

Numerous reasons might be assigned for this rather unfortunate circumstance, but to my mind no one cause has been so instrumental in producing the result as the introduction of the plastic or vegetable compounds as a base for artificial teeth. It is very true that these have their place in dentistry, and circumstances frequently occur when it would appear almost impossible to succeed without them; but it is not the use so much as the abuse of these materials that has been working the damage. First, as to their use. Celluloid and zylonite having proved themselves insufficiently durable, my remarks shall have no reference to them, and I shall consider vulcanite rubber as the only plastic base now in use. What are the circumstances under which rubber can be used to best advantage? Undoubtedly in full dentures, when great absorption has taken place, and something of a plastic nature is required to give sufficient bulk to the denture, to re-establish the proper contour and fulness.

It would be difficult to find a better material from which to construct an interdental splint than vulcanite rubber, while in full metal dentures its use as the means of attachment is invaluable. Under these few conditions rubber may be used to advantage.

Now as to its misuse and the ill results accruing therefrom. What are some of these ill results? *First*, a lack of any thought or care for prosthetic dentistry by the best members of the pro-

fession, with a consequent decline of this branch of our calling, and a desire to separate from it. *Second*, the advancement of quackery. *Third*, a desire upon the part of those persons who place a greater value upon the absence of pain than they do the presence of their natural teeth, preferring to part with these precious organs and substitute artificial ones. *Fourth*, an increase in diseased conditions of the mouth, both of the soft tissues and of the teeth themselves.

The first ill result is certainly one to be deplored, much harm frequently coming from the growing desire of many members of the profession to shun mechanical work. To my mind the perfect dentist, the dentist most able to comprehend the wants and needs of his patients, must give equal attention to each branch of his calling, be it operative, therapeutic, or prosthetic. To do this it is not necessary that he should actually perform all these duties himself, but his mind should be instrumental in controlling them, permitting no prejudice to make him give all thought and attention to operative work, with an utter disregard as to what may be the ill results of his inattention to prosthetic work.

By way of illustration permit me to report a recent case in my own practice. The patient, a lady, had for a number of years been under the care of a prominent dentist in another city. Upon examining her mouth I found a number of perfectly-inserted gold fillings, plainly showing that the operator possessed much skill in this direction. I also found the upper bicuspids and molars on the left side as well as one or two teeth upon the right side to be missing. For a number of years the lady had urged her dentist to construct a plate for her, or in some way close up the deficiency. This he refused to do, saying that she could not wear a plate on account of a bony ridge in the hard palate. Every time she called upon him she made the same request, and always received the same negative reply. The experienced dentist may well know what had taken place by the time she came into my hands. Existing as there did a marked disposition to pyorrhœa alveolaris, the lower teeth from the want of occlusion had left their sockets, and most of them were striking the gum in the upper jaw, thus excluding all possibility of remedying the trouble without extracting the lower teeth. And yet this practitioner, wedded, as he must have been, to operative dentistry, stood idly by and permitted these teeth to be lost, or worse than lost, as they were rendered absolutely useless, simply because he could not exert himself sufficiently to prevent it. What excuse could be offered for such gross neglect of duty. Certainly the ridge in the hard palate was not sufficient to bar all

possibility of inserting a partial denture, and even admitting that it was, a small clasp plate could have been constructed, and it would have been many years before the clasps would have caused the utter destruction of so many teeth, and it is doubtful if they would ever have done so. The conclusions to be drawn from this case are these. Had vulcanite never been introduced into the dental laboratory, it is safe to assume that this "operator" would have had a better schooling in metal plate-work, and having this extra knowledge, he would have used it to advantage by constructing a partial denture for the patient, and thereby preserved the teeth which she is now compelled to sacrifice.

The second ill result, the advancement of quackery. The standing of a profession is known by the acts of its members. Who are the members of the dental profession? It is to be feared that the public look upon all dentists as members of it. Probably in a measure they are. All quacks may be dentists, but fortunately all dentists are not quacks. Vulcanite rubber is the nucleus from which sprang dental quackery. Can we for a moment suppose that this class of dentists would exist in such great numbers if they were compelled to form all their dentures upon a metal base?

The third ill result, a desire upon the part of those persons who place a greater value upon the absence of pain than they do upon the presence of the natural teeth to part with these precious organs and substitute artificial ones. How frequently do we hear our patients remark that they intend to have all their teeth extracted to make room for a lifeless substitute. Would such thoughts occur to them if they were compelled to pay the price of a gold plate to accomplish their desires? These people imagine they would be loosing nothing and gaining everything. How frequently and how cruelly are they disappointed. Think of the changed expression, the lost lines of nature's beauty, the impaired articulation; with all these lost they have probably gained the coveted absence of pain, but the price has been the loss of that which, as God's creatures, we are given and bound to preserve, nature's own cheerful countenance.

For the sake of argument we will imagine the majority of all our patients to be poor, and the existence of this unfortunate condition promotes the idea of economical dentistry. Naturally enough they look upon the extraction of their teeth and the insertion of a plate as true economy. How much greater benefit could they frequently receive by appropriating the money thus expended by attempting to preserve those few teeth which were defective at the

time that they had them *all* extracted regardless of their condition.

The fourth ill effect, the increase in diseased conditions of the mouth and teeth. This result of itself should be a sufficient argument to cause every conscientious dentist to make an effort to overcome it by giving more thoughtful advice in regard to artificial work. Besides the inflamed condition found in the mucous membrane produced by the non-conductibility of the rubber, there is the more serious fault of the production of decay about the necks of the teeth owing to the ill adaptation and unnecessary thickness frequently found upon a rubber plate at this point.

Furthermore, the congested and inflamed condition of the mucous membrane causes additional trouble by producing an unhealthy vascular and nervous supply to the alveolar border, sooner or later causing rapid absorption of that process, and a consequent loosening of the remaining teeth. In the examination of fifty-three mouths, wearing either a partial or entire denture upon a plastic base, this condition was plainly discernible in forty-four of them, the remaining nine showing little or no detrimental result. So far as my observations have informed me, it requires from four to five years continual use of a rubber plate to produce the most disastrous effects, the most aggravated results appearing in those patients wearing their dentures while sleeping.

Having thus enumerated a number of unfavorable results produced from the misuse of rubber, together with the circumstances under which it may be advantageously used, it yet remains for me to briefly speak of the good and bad in metallic bases. First as to the metals to be used for this purpose. *In the proportion that gold is the best metal to be used in filling teeth, a corresponding preference should be given to its use in the construction of plates.*

Silver, while much to be preferred to rubber for small partial plates, can only boast of its cheapness as a further recommendation. The weight of aluminum is all that can be said in favor of that material. As I have previously admitted, while it is not possible to use gold in every case, it is certainly deserving of a more general use. It has for its advantages, conductibility, perfect adaptation, cleanliness, strength, and lack of bulk. In the fifty-three mouths previously referred to as wearing rubber plates, twenty-two of them were replaced with gold as a base. Every one of them soon began to exhibit a marked improvement, and those which it was possible to keep under observation resulted in a complete transformation, the inflamed, spongy mucous membrane having disappeared, while

teeth that were much disturbed have taken on new life. What other changes might be brought about by a more generous use of this precious metal? Many of the ill results produced by the indiscriminate use of rubber would be overcome, mechanical dentistry would soon have a fascinating influence over the average practitioner, and the desire of divorcement of the two branches of our work would disappear, producing altogether a more generous and more useful profession.

To encourage a more general use of metallic bases, I have devised a method by which the swaging process is much simplified. The principle, while not entirely new, is nevertheless new in its application. By this method I dispense with the use of the horn mallet almost entirely, permitting a series of counter-dies (which I have named "progressive counter-dies") to perform the work previously accomplished with the horn mallet. The die is formed in the usual way, and the series of counter-dies are formed in the manner illustrated upon the black-board.

It may be argued that a plate swaged in this manner will not retain its shape so well as one coaxed into position by the use of the mallet. My idea is this, that the force of the blow being equally distributed to all portions of the plate, the result is the formation of a plate which will be much more rigid than one swaged in the old way. However, this may be a point for argument, and I hope to hear some remarks in reference to it.

No matter how great care is taken in swaging a plate with the horn mallet, every blow of the mallet is bound to be recorded upon the surface of the plate in the form of a bump, or a depression. These inequalities, while not necessarily visible to the eye after polishing the plate, may be plainly detected by the touch. The saving of time is a consideration. I have two plates here, one of them being swaged in seven minutes and the other in five. There being no scratches or imperfection in them, it only requires a few minutes' use of the brush-wheels to accomplish this part of the work.

DISCUSSION.

Dr. Guilford.—The paper has proved a very interesting one, because it has dealt with what is commonly known as a practical subject. I was pleased to have it introduced, inasmuch as there are so many things connected with the making of plates that we do not understand. In what proportion of cases the metallic base is better, or the best, and in what proportion the vegetable, is hard

to determine. While there are objections to the use of vulcanite, it certainly possesses some advantages. In my practice I have had a number of cases in which I did not succeed in getting a satisfactory fit with the metallic base, where I afterwards did with vulcanite; and, on the other hand, there have been cases where I have replaced vulcanite with gold with the very happiest results; so I think there is a large field for the employment of each.

It is deplorable, indeed, that with so good a material as vulcanite we should have so many ill results; it does seem as though every good thing in this world carried with it some objectionable features. Dentistry has suffered severely from the abuse of this material as it has also from painless extraction, amalgam, and bridge-work; all of them good and useful in their places, but followed by unfortunate results when improperly employed.

I think the abuse of vulcanite has come largely through careless manipulation and from the fact that we have not understood very well how best to manufacture it. Our knowledge in regard to the proper vulcanization of rubber for dental purposes falls very far short of that possessed by those who manufacture vulcanite for commercial and mechanical purposes.

When we try a new make of vulcanizable rubber we usually find a vulcanized sample in the box as an evidence of its quality; yet those pieces are generally vulcanized in the manner that rubber is vulcanized for mechanical purposes, between steel or iron dies and under the influence of steam at a higher temperature than we use. I think, in this matter of vulcanizing rubber, that many of the misfits are due to the fact that we do not understand how to manipulate the material. There are different theories in regard to the behavior of rubber during vulcanization. We understand some facts in regard to it, but we have not yet learned why in certain cases we cannot get a satisfactory fit with vulcanite, whereas in other cases the very best results are had under seemingly similar circumstances. Rubber, during the first stage of vulcanization, expands, and during the second stage contracts. Drs. Southwick and Snow both claim that in vulcanizing rubber it should be given a chance to expand while it is in a condition to do so, and afterwards it should be kept under very heavy pressure to prevent undue contraction. Dr. Southwick further believes that in the cooling of a plate the rubber contracts towards the part that is thickest, thus causing it to rise up and leave the model in the centre where it is thinner. For this reason the plate will rest upon the ridge, but not upon the palatal arch. He corrects this fault by reheating the

plate and forcing it down in the centre after the flask has been opened.

I was told to-day by one who professed to know, in discussing this subject with him, that the large rubber rods which the electricians use, from an inch to an inch and a half in diameter, and as dense in the centre as at the surface, are vulcanized under steam at a high pressure and kept there for a long while, and that the steel moulds in which they are formed are kept under hydraulic pressure while undergoing the vulcanizing process. In this way only, he claimed, could solid and good results be obtained. We should take a hint from this and see whether we cannot improve our methods.

There are a great many points in regard to vulcanization under discussion and dispute, and it is a reproach to us that we do not understand them as thoroughly as we should. There are causes underlying the difficulties we are contending with, and I hope that in the near future we will get to the bottom of them.

In regard to the construction of metallic plates, I think success depends very largely upon our manipulation of the plaster in taking the impression and making the model, and afterwards in carefully and properly bringing the metal into uniform contact with the die in swaging.

The method of swaging described by Dr. Broomell in his paper is new, and seems to possess some valuable features. I first saw the description of it in the recent edition of Richardson's "Mechanical Dentistry," and I propose to give it a trial.

Dr. Chupein.—I would certainly recommend this plan of Dr. Broomell's in swaging a plate. I noticed it, as Dr. Guilford has said, in the late edition of Richardson's "Mechanical Dentistry." A plate, after it is swaged, ought to be exactly as the plate was before it was put on the die at all, only changed in form, and when it is at all stretched, as it is apt to be when driven by the horn hammer, the chances are that it will not fit at all. These successive counter-dies that are advocated by the essayist will effect this a great deal better than a horn hammer. Besides that, I am inclined to think that a plate brought up to the roof of the mouth in this way is not so much bruised as a plate would be if it was brought up by the use of the hammer.

I think there is an advantage in a gold plate over a rubber plate in certain mouths. Yet I have seen mouths that do not show what is called rubber-sore mouth, that kind of raw appearance, as frequently I have seen it under a gold plate; but I am very much

inclined to think under both of these cases it is more due to uncleanliness than to anything else; because I have seen gums as healthy under a rubber plate—well taken care of—as I have seen the same under a gold plate. I think there is a great deal of truth in what Dr. Guilford has said in reference to the action of rubber, or as to the manner of vulcanizing it. There is a great deal to learn in the manner of vulcanizing. I have been perfectly nonplussed sometimes in trying to find out what is the cause of porosity in rubber, and have tried all kinds of experiments to determine the reason for this defect.

Dr. Head.—One can readily theorize concerning the tendency vulcanized rubber has to shrink towards the thickest part, if the vulcanizing is done on a plaster model, because the plaster is destroyed, thus leaving no means of attesting the accuracy of the deductions. But if the case is vulcanized on a tin model, it in each instance will accurately fit each indentation of the metal. This would seem to prove either that plaster has some evil effect on the rubber or that no such shrinkage takes place.

The success which attends the vulcanizing under high pressure would seem problematical. We dentists vulcanize under a pressure of eighty to one hundred pounds to the square inch, and frequently find our plates porous when the highest pressure is used. It is true that certain companies may vulcanize under a still higher pressure than any used in the dental profession, but it would not seem that pressure is the one panacea for porosity, as I know of a certain rubber shoe-factory where the vulcanizing is done at forty pounds, and yet the shoes are never porous.

In the light of these facts it would appear that the warping of plates, and their tendency to become porous, has yet to be satisfactorily explained.

In reference to the paper on swaging, I would say that Frank Faber told me of a method similar to this some ten years ago, although it was not perfected to such an extent as has been shown to-night. He *never* used the horn mallet, but simply bent the gold into the counter-die with his fingers, and drove it into shape by hammering on it with the zinc die. The only objection to this method was found in the fact that high arches tended to split the gold. This difficulty the lecturer this evening has beautifully obviated.

When Dr. Faber was swaging up a plate and wished to avoid cutting out the air-chamber, he used a case of zinc that did not run over the gums similar to the first counter-die spoken of by the

lecturer this evening. With this case he drove the plate down around the air-chamber and into the interstices of the rugi.

This, of course, was exactly the same principle as the one set forth this evening, but we owe Dr. Broomell many thanks for the complete and scientific way in which he has developed it.

Dr. Chupein.—I forgot to mention when I was up that I had an idea some time ago of how vulcanite that had sprung could be brought back to its correct shape.

We all know that if we make a vulcanite clasp around a tooth, and the patient complains that it seems to be loose, by simply oiling the clasp and heating it gently with a spirit-lamp we can bend it with the pliers and change its shape so that it hugs the tooth tightly again. If you duplicate the model in any particular case, and make one of these on tin, you can bring up a whole plate that should happen to have sprung by pursuing the same plan. Put the plate on the die and make a case of plaster on the palatal surface of the plate; and by putting it in a flask press, and placing the case, press, and all in a stew-pan of oil, and heating the oil, you can so soften the rubber that the plate may be pressed up and made to fit the die accurately without the trouble of doing the whole work over with the chances of another misfit.

Dr. Bonwill.—Let us be liberal to one of our greatest aids for good,—the accused rubber plate.

Many who may not have used this article for plates have been very glad to make the so-called Coffin plate from this material.

How many of the graduates of to-day can make a respectable plate of any kind?

When in practice in Delaware, up to 1871, I had largely to deal with plate-work. I place in more gold than rubber, yet I am unwilling to concede the palm to the noble metal.

You are all aware that if gold were the only material endorsed by the societies, how very few of the poor would ever be able to wear artificial teeth.

While gold is the most valuable material for partial sets, yet rubber is not as bad as it is represented to be. I have used it for many years, and have yet to see the first effect of poisoning by the presence of mercury or through its non-conducting properties.

The subject was then passed, and the President called upon Dr. Rhone, of Bellefonte, formerly President of the Pennsylvania State Society, who had an obturator which he desired to exhibit.

DUPLEX OBTURATOR.

BY DR. J. W. RHONE, BELLEFONTE, PA.

To enter upon a discussion of the anatomical construction of the normal palate and its functions in comparison with the abnormal, more particularly that of a congenital cleft palate, involving the hard and soft tissues, would seem unnecessary, as all seekers for information on these points can find them in our standard text-books, and can also compare the normal with the abnormal in the living.

Correcting all the evils of this malformation is more than should be expected, but the leading difficulties that can be remedied are defective articulation and enunciation, and the escape of solids and fluids through the nasal passages, and the difficulty of swallowing.

This brings us to the important point, How can these evils be best overcome?

Judging from the past history of the surgical side of this question, surgery has not proved a success in this line.

It would then seem that mechanical appliances of some kind are the only means of relief at hand. But here we are again perplexed; the number and forms of these appliances are quite numerous, and all laying claim to something that seems new and novel. It, however, is not the purpose of this paper to attempt a discussion of the merits or demerits of any, excepting so far as may be necessary by way of comparison.

However, with comparatively limited experience in the construction and adaptation of appliances to be of benefit to patients of the class named, I would state that *they must be made in two parts* to bring about the best results and most comfort to the wearer.

The obturator in one piece *cannot be made* to compare in adaptation and comfort to the duplex. The reasons are plain; no part of the rigid (one piece) appliance can move without moving as a whole, which *will* produce irritation and discomfort at some points. With the duplex obturator, if properly constructed, this is avoided. The front half of the plate will be firm, while the posterior half, a hard rubber velum, attached to the plate by a hinge,[1] can move

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[1] To whom the credit of the connecting hinge in obturators with a hard rubber velum (or "chestnut," so called in the *American System of Dentistry*) belongs I have no means of knowing, but there is a description of a hinge and

freely at any and every motion of the cleft uvula, and the wearer is enabled to talk or read aloud, and, not least, take food with comfort.

It might be in place here to state that about twenty-five years ago I made an obturator for a then young woman (who had a congenital cleft palate of both the hard and soft tissues) on the plan described by Dr. E. A. Bogue. The description is found in the *Dental Cosmos*, vol. ix. This obturator also consists of two parts, but the joint is rigid with a soft rubber uvula. This part (the soft rubber) doubtless was meant to be the important part of this appliance, but in my experience proved very objectionable on account of becoming very offensive in a short time. Later I substituted hard rubber, which proved more satisfactory than the soft, which practically made it a rigid appliance.

So far as I know, the obturator is still worn, but in point of comfort and use to the wearer it bears no comparison with the duplex connected with a hinge.

In making this instrument with a hinge I have tried to combine what seemed to me good common sense principles.

While a good cast of all the parts of the mouth with the hard and soft clefts is desirable, it is not essential, as it can only be used as a general outline, not as the means to gain the end.

My method to take an impression is first to take base plate gutta-percha and soften in hot water, and mould to suit the mouth; bend a fairly strong wire and attach to the tray for a handle. This done, fill the tray with softened beeswax and take an impression of all the parts as near as can be taken with this material. This secured, trim the wax wherever it rests against the soft parts, at the same time shaping it so that it will retain the plaster in carrying it to the parts in the mouth.

A few words about plaster and how to use it. The plaster should be about medium in its setting qualities. Fill a mixing-cup about two-thirds full of water, and add small quantities of plaster,

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bulb given by George Parkinson, M.R.C.S., of West London Hospital. See *Dental Cosmos*, vol. viii., page 449.

The hollow rubber bulb (or velum) and spring, as described in the *American System of Dentistry*, by Dr. Baker, proved unsatisfactory in my hands, either with or without a spring. With the spring there was an unpleasant grating that annoyed the patient, and without the velum was too light. The hollow rubber bulb, on account of its lightness, might answer a good purpose for children when first wearing an obturator in place of the perishable and offensive soft rubber.

adding and stirring until it is about the consistence of thin cream. Keep agitating until the plaster commences to thicken, which may take five or more minutes, if too much plaster has not been added. The least quantity that will do the work will be the most satisfactory. While this method will take more time, the plaster will not be so strong, and will fracture more easily, hurting the patient less.

Before your plaster is ready have the patient in the chair, and as soon as the plaster is in the tray draw the head back with the mouth well opened, put your filled tray in good position in the mouth, and then draw the patient's head forward so as to prevent strangulation, and press the tray with its contents to all the parts as quickly and as gently as you can.

When the plaster left in the mixing-cup will break with a clean fracture, it is an indication to remove the impression, which can only be done in parts, but can be accomplished easily if care has been taken in mixing the plaster and in shaping the wax impression. When all the pieces are removed and placed on the tray, there will still remain some carving in places, and additions to make in others.

To get a perfect impression of the soft parts in their various positions is impossible. Any one that has observed the motions of the cleft tissue knows that the parts are seldom at rest.

Now varnish the impression, oil slightly, invert, and embed the upper half in plaster. When set, trim, varnish, oil, and build up one side with plaster. When set, shape the edges, varnish, and build up the remaining half. After the plaster is well set, if the sections have been properly taken, there will be no trouble in separating them. This done, replace the section of the cast and put away for future reference.

The next important part is to make the front part of the obturator, to which whatever teeth that are needed must be added, and at least one tooth, preferably a molar, on either side of the mouth should be clasped with a good substantial gold clasp attached to the plate.

Before taking the impression for the plate it will be necessary to close the fissure beyond the hard palate with softened wax, so formed that it can be easily removed without injury to the walls of the cleft. The margins of the cleft must, however, be exposed enough to be well defined in the impression, which should be taken with plaster in the same manner as for any other set of teeth.

After a good cast has been secured, proceed as in any other case where a plate with a few teeth and clasps are needed.

The upper side of the plate must be adapted to the margins of the cleft, and also a place provided for the anterior end of the hinge, which may at the same time be attached to the plate. The plate must not extend beyond the hard palate.

But there still remains the most difficult as well as the most important part to do, that of making, attaching, and rightly adjusting the hard rubber to take the place of the lost soft palate.

Before reaching this point, a good, strong, gold hinge should be secured, made of eighteen-carat plate; one thirty-second of an inch thick would not be objectionable.

The width of the cleft must be the guide for the width of the hinge.

The anterior end of the hinge need not be over three-eighths to one-half of an inch in length, and set forward from five-eighths to seven-eighths of an inch from the rear margin of the plate, and should extend from three-eighths to one-half of an inch past the posterior margin of the same, on which to attach the hard rubber bulb. It is important that the joint of the hinge has lateral motion, so as to allow the hard rubber substitute to move from side to side. The object of having the joint of the hinge so far forward is to prevent the rubber bulb from raising at too much of an angle.

After the hinge is connected, form a wax bulb wide enough to fill the space above the cleft, somewhat oblong, rounding edges nearly flat on the nasal side, with a widening and depression towards the posterior, so as to give the lower side a partial arch, rounding towards the sides to allow the cleft tissue to play underneath on either side. Place the plate and the bulb attached in the mouth. Mark the wax wherever you find unequal pressure. Remove the plate and bulb and carve the wax where marked. Again replace and follow these directions until the plate seems comfortable, being careful not to get the wax bulb too small. This done, disconnect the hinge and duplicate the wax bulb in hard rubber.

Polish the rubber, connect the appliance, and place in the mouth, let the patient wear it until points of uneven pressure will make the parts tender. Mark the bulb at the tender points, remove the case, and carve the rubber at the places marked, and again polish, replace, and continue this course until the obturator is comfortable. At no time allow the parts to become chafed.

A lady for whom I made an appliance about six years ago on the plan as here described is as comfortable as it is possible to be under like circumstances. She can enunciate and articulate distinctly with ease, either in conversation or reading aloud.

But for any person to promise, or to state, that a person under such conditions could be enabled by means of *any* appliance to speak or read without betraying the defect to an experienced ear, would simply be an *exaggeration* and a *deception.*

Notwithstanding, when such unfortunates can be helped so as to be comfortable and be enabled to converse with ease and comfort to themselves and pleasure to their friends, we can lay claims to advancement.

There is another matter of no less importance than that of speech in this connection, that is the ability to take food without the necessity of leaving the table to remove particles collecting above the appliance to prevent it (the food) from passing out through the nostrils, as was the case with an obturator formerly worn by my patient, made of one solid piece of hard rubber.

Another difficulty no less unpleasant has been overcome with the duplex obturator she is *now* wearing.

DISCUSSION.

Dr. Guilford.—Do you treat the soft palate in any way before taking the impression.

Dr. Rhone.—No.

Dr. Guilford.—No trouble?

Dr. Rhone.—No.

Q.—This bulb is solid?

Dr. Rhone.—Yes. My first experience was with a hollow bulb with a spring. That was unsatisfactory. I removed the spring, as the bulb was too light. I changed that for solid rubber, which has proved very satisfactory in this case. The bulb placed under in that way forces the instrument up in the upper parts and closes the nares entirely for the time being. The patient can breathe with it in place with the mouth closed comfortably. With the rigid obturator no part will move without moving the whole, and the difficulty she had was that the teeth, for instance, would suddenly move up and down. That, of course, is entirely obviated now, and she is perfectly comfortable.

Dr. Deane.—The subject of obturators is, in a measure, new to us as a society, but I have had some little experience with them. I find the most successful joint is the ball-and-socket joint, with which the parts to be restored can be thrown from side to side by the divided muscles of the soft palate while talking. It fills the space better and you secure better results. You do away more with the nasal twang. The rubber bulb, especially where you are trying

to restore speech, can be handled easier and better than the uvula fastened with the hinge-joint.

I also find a great deal of benefit in those cases in using, first, soft rubber velum. This is made by vulcanizing two pieces or flaps of soft rubber together and attaching it to a plate with a pin-joint. You can move this up and down the rod or pin for the space of a quarter or half an inch until you find the proper point of articulation. This is a subject for experimental practice, and after your patient has worn an appliance of that kind through the experimental stages, you will find the general result will be much more successful when you put the hard rubber palate into the mouth.

My system of taking impressions differs a little from the Doctor's. I simply take an impression as for the ordinary hard-rubber plate, extending the rear portion back in the centre, in the form of a dovetail, and finish that plate up, adding any teeth that may be missing and banding teeth when possible; to this I would affix a bulb of impression compound, being careful to fasten it securely to the dovetail of the plate; this can then be kept warm and moulded to fit the open space in the cleft, both above and below the flap of divided tissue. I should think the Doctor would stand a chance of having severe trouble with the plaster impression shown here.

Dr. Rhone.—No; I have made it a point to have the patient bend forward and throw the head back, so that this could not possibly occur.

Dr. Deane.—That would eliminate the difficulty to a certain extent, but I should be very much afraid in those cases; they don't seem to have the ability to handle the muscles of the palate and throat, and such patients could not render any assistance at all. I came near having an accident, in a case of that kind, which led me to do away with impressions of the soft palate and adopt the modelling compound.

I have in mind a case of a child seven years of age which I treated with the soft rubber velum; the child is now twelve or thirteen years of age, and while the face and lips are disfigured he articulates well, and can sing and pronounce his words accurately, but after taking the plate out you can't understand a word he says. The experimental stage was the worst with soft rubber, but with hard rubber in his mouth he gets along very nicely.

Dr. Guilford.—In the few cases of cleft palate I have had I have found difficulty in taking the impressions, because the soft palate was so sensitive to the touch. I have generally found it necessary to treat the parts in some way before attempting to take the im-

pression. Some operators recommend the application of camphor-water; others, manipulation with the fingers; but I have found that weak doses of bromide of potassium administered internally every three or four hours for a few times before the operation is sufficient to allay sensitiveness in cases of that character.

The plan spoken of by Dr. Rhone is very similar to that used by Dr. Baker, of Boston, in which he also uses the hard rubber bulb.

Dr. Rhone.—In regard to the hollow bulb, I experimented with that in this case first. I found it too light. It didn't drop when it should have dropped. This drops very nicely. There is no undue pressure on the mouth of this patient.

At a regular meeting of this Society, held October 13, 1894, President Peirce in the chair, Dr. Wm. L. Fish, of Newark, N. J., read his paper on "Cervical Cavities and their Treatment."

CERVICAL CAVITIES AND THEIR TREATMENT.

BY WILLIAM L. FISH, D.D.S., NEWARK, N. J.

Mr. President and Gentlemen,—The subject of cervical cavities and their treatment, while not one that we would commonly admit was open to argument, has given rise to so many diverse opinions and methods of operating that further discussion may not seem out of place. In dental operations, as in all other operations, there are certain laws of philosophy, and any deviation from these natural laws will be met by signal failure. That they are violated, in both the manufacture of our instruments and our methods of operating, so far as it relates to the class of cavities with which we have to deal, it is the object of this paper to prove. As practitioners we fully realize that of all cavities with which we have to deal those of a cervical character give us most concern, for in them we may achieve our grandest successes or our most dismal failures. We find that one of the greatest drawbacks to success lies in the difficulty of pushing back the gum, a feature simple of itself, yet conducive to the greatest amount of trouble to patient and operator. The first device used for this purpose was the silk ligature held in the hand of the patient. Then we began to have a class of clamps that have given us fairly good results as far as they have gone. But they had all a vital fault. Being constructed in the form of a spring with unequal arms, they seek the smaller diameter when applied to the tooth, and slip either up or down upon the slightest touch. Also, they are absolutely useless in that form of cavity known as compound cervical approximal, where both cavities run into each other. The use of the paper disk is an impossibility. In the treatment of bicuspids and molars we have been sadly handicapped, as these clamps have been poorly adapted to use upon them. One method that I had brought to my attention this summer deserves a passing mention, as it is the invention of one of our Jersey dentists (a fact that I am not very proud of). This eminent D.D.S. stated that he "never used either silk or clamps of any kind. His office being wired for electricity, he simply attached his cautery. and with the loop burnt the gum away to the desired extent." That, gentlemen, is the nearest approach to the sting of a "hornet"

that a Jersey dentist has ever attained. Realizing the great need for a clamp of this class that would be as nearly as possible universal in its application, I have endeavored to construct one, intended to be used for cavities of both upper and lower jaw, right or left side, taking in molar teeth. There are in its construction none but purely mechanical and positive principles of action, the gum being pushed back by a simple turning of a thumb-screw, the operation being so gradual as to be almost painless to the patient. The method of attaching the clamp to the tooth next the one to be operated upon leaves the latter clear and free for further manipulations. To better enable those present to understand the workings of the clamp, I have made three section models showing its application to the different teeth. You will see at a glance how readily it can be applied. No. 1 shows its application to a lower bicuspid

of the right side, the receder arm extending back to the molar tooth so that the gum can be readily forced down upon the neck of the tooth. The clamp may be applied to the other side of the mouth by simply reversing the receder arm in the slide. No. 2 shows the application to the lower centrals and laterals. The narrowness of teeth permits of its being applied to the third tooth, thereby giving ample space for work. No. 3 shows the application to upper centrals and laterals. You will observe the receder is capable of being turned so as to allow its use upon small- or large-necked teeth. In filling teeth in the back of the mouth, where the dam is precluded and where the gum bleeds at the slightest touch, you will find this little device to be invaluable.

A great drawback to the successful filling of these cavities lies in the lack of that power of differentiating between the cavity to be filled with gold and that to be filled with plastics. In the case

of a gold filling, I would proceed in the following manner: After the usual preliminaries incident to the use of gold, such as applying the dam, clamp, etc., I would proceed to excavate, taking pains to cut well away all soft or defective enamel, even though it may enlarge the cavity to a considerable extent. In so doing endeavor to so shape the same as to have a symmetrical curvature to the entire line of cavity. Do not have a straight base line to a cavity that may extend entirely across the tooth, for the effect will be to make the work look heavy, inasmuch as the oral cavity is made up entirely of curves. I should avoid in every case the use of the retaining point, which is an abomination, a snare, and a delusion, for by its use more bad results are attained than by any other method now in vogue. Not only does the retaining plug transmit thermal shock to the pulp, but sooner or later the poor deluded patient awakes to the sad realization that there is an ache, notwithstanding a filling remains in the tooth. By the use of a slight undercut these results are avoided and a filling produced that will show the encroachment of decay by loosening in cavity. In the making of an undercut it is preferable to use an inverted cone bur that has not too sharp a point. My reason for using this style of instrument is that the larger diameter of cavity is at the absolute bottom. The result being that the gold as it is forced to the walls in the course of manipulation is bound to hug the floor, while in an undercut made by a round bur it will leave the floor of the cavity, from the fact that it is forced to the side walls and will seek the larger diameter; this larger diameter is at a point one-half the diameter of bur-head from bottom of cavity. It is this fact that causes a filling to "ball up," so to speak. After making my undercut I would level the edge of my cavity from within outward, taking pains to make a clear outline free from any flaws, using to make the same a diamond cone point. A bur will be apt to gouge in and cause trouble. This bevelled edge will tend to lessen the tendency to fracture in the enamel margin, during the condensing and finishing process. I now would proceed to line up my entire cavity with absolutely soft gold, packing it around the entire walls and allowing the ends of the cylinders or ribbons to project a trifle outside of the cavity. After lining throughout in this manner, take semi-cohesive gold and work in upon the layer of soft gold by hand pressure with a rotary motion, which will tend to unite and further condense the first layer. In every case use great care so as not to allow the harder gold to come in contact with the enamel, or allow the instrument to cut through the soft

gold. After condensing well I am at liberty to fill in with hard or cohesive gold, and, after a thorough burnishing, finish with any method that may seem most desirable. A filling put in by the foregoing method will be found to stand the test of time. Its very construction making it absolutely tight and the walls and margins free from fracture. In the preparation of a cavity for the reception of any of the soft or plastic fillings, the shape would be the same as that for gold, with the single exception that the bevelled edge should be discarded, and the cavity made as near as possible parallel through the thickness of the enamel. This can best be accomplished by using a right-angled fissure-bur that has the flutes or blades cut on a spiral; the latter form will prevent the bur from chattering, enabling the operator to produce a perfect margin. In the manipulation of alloys I find that the greatest satisfaction is derived from the use of the ball instruments, for the reason that no matter in which direction the pressure is applied it is direct, and the alloy will be found to be more thoroughly condensed than when put in by any other instrument, and the mercury will work to the surface, the ball having the effect of a roller. In finishing be sure and have a surplus of alloy to work down with the burnisher, that little or no mercury may remain in the filling. While the foregoing methods may seem to a casual observer somewhat laborious, a careful study will show that they are based upon certain principles of mechanics which are too often lost sight of in the hurry and worry of a busy professional career.

DISCUSSION.

Dr. Truman.—The clamp seems to be an effective one; but it is highly complicated. There are few clamps so well made that they are not liable to cause disturbance. I think those who are here will bear me out in the assertion that if a clamp be forced upon the gum margin, as that appears to be, irritation will necessarily follow; pathogenic germs will gather around the tooth that may eventually result in pyorrhœa alveolaris, or at least in inflammation of the pericementum. This is not mere theory, for I have observed such complications for years, ever since the introduction of clamps.

The gentleman has asserted that retaining-points are a snare. Now, I am happy to say that I do not agree with him. Retaining-points were introduced, in the earlier days of the profession, in a form, perhaps, that was not satisfactory. I remember, twenty-five years ago, I called attention to retaining-points properly made as I considered they should be. I practised and taught for many

years that mode of filling teeth and anchoring them. And I hold to-day that it cannot be relinquished except in special cases. What do you get by undercutting? If there is any break or any pressure you destroy the anchorages at once, and the filling is lost. If you want to hold a filling in a tooth you must anchor it somewhere, and I deny, positively, that retaining-points cause thermal action upon the nerve if they be properly placed, any more than deep undercutting or the filling itself, if it approximates nearly to the pulp.

Dr. Broomell.—I entirely agree with the essayist on the subject of retaining-points. It has always been my opinion that they are valuable simply as a good beginning on which to place a filling, and do not deem them useful for holding a finished plug in place. As the operator approaches the surface of the cavity, there is a tendency for such anchorage to break away. I myself always use undercuts, and I think them far preferable to retaining-points.

Dr. Truman then asked those opposed to retaining-points what they would do with a tooth that had no cavity in it that might be necessary to build out. "Formerly before we became so æsthetic that we would not have gold in front of the mouth, it became necessary to occasionally build down an incisor. Even now that happens, and what can you do with it unless you make retaining-pits? When teeth are perfectly smooth, I build these down by making a circle of pits all around the tooth-margin. Then placing a screw here and there, I insert the gold, and such fillings have remained secure and firm for years. I would like to ask the gentlemen who are opposed to this mode of filling how they would treat such a place or cavity."

Dr. Broomell.—Dr. Truman says he occasionally puts in a screw, and I think he answers himself; whereas, if you have the retaining-points you run a risk of not getting firm union.

Dr. Head.—Does the gentleman mean to say that a screw fastened into the tooth-structure will have a more intimate connection with the tooth-structure than gold hammered in there.

Dr. Broomell.—No, I do not mean that. I contend that gold in the shape of wire screws is stronger than any you can put with a plugger into a small cavity that has just a retaining-point.

Dr. Boice.—I can heartily agree with Dr. Truman as to the influence of clamps on the teeth. I see it every day, and I have been thinking, for the last five years, that it would be better if we had never seen a clamp. I am using them less and less every day. The clamp presented here to-night is a very ingenious thing, and contains many valuable points we can utilize.

In reference to retaining-points, there is a light-house on the British coast that was fastened year after year with bolts into the rock, and every time the storms came, it would be washed away. The bolts represent the same thing you have in filling teeth. It was my pleasure when I began to study dentistry, to come in contact with a man by the name of Head, and he said retaining-points were bad, therefore he wanted grooves. Now the light-house went away year after year, until a certain engineer cut grooves in the rock and put in the blocks, and then a key or centre block in that, and it has been standing for a hundred years. If you use that same principle in filling a cavity you have an easier filling and a better anchorage.

Dr. Faught.—I have listened with great pleasure to the paper. I am one of those who take the author's position in regard to retaining-points. I have observed numberless times, in cavities where fillings have been dislodged, that you will often find a little bit of gold in the retaining-pit. This fact shows that when the filling is completed the retaining-point is of no further use, no matter how firmly it be condensed. I therefore shape the bottom of the cavity so that it will hold the gold without any necessity for such aid.

In regard to the clamp, I cannot believe it is such a complicated structure. It seems to be made according to true mechanical principles. Dental practitioners will use clamps, and if one uses a clamp at all, I believe this one will do the work better than any of those furnished to us by the depots.

Dr. Fish.—I take issue with Dr. Truman in reference to retaining-points. If a tooth is strong enough to allow an undercut, no matter how slight, if the walls of the cavity are made absolutely parallel, and that cavity is filled with perfect edges, the fillings will not come out.

The subject was then passed, after extending a vote of thanks to the essayist.

The President then called upon Dr. Brubaker to read his paper on "The Causation of Dental Erosion."

THE CAUSATION OF DENTAL EROSION.

BY A. P. BRUBAKER, M.D., D.D.S., PHILADELPHIA.

BEFORE proceeding to offer any facts or arguments relating to the causation or pathology of dental erosion, as it is observed on the labial surfaces of the incisor teeth, permit me to summarize the existing state of knowledge upon this subject. In the minds of most practitioners dental erosion is associated with the presence of

an abnormal secretion, acid in character, discharged from some of the labial glands; the secretion bearing to the erosion the relation of cause and effect. This supposition is supported by the fact that if the inner surface of the lip be examined in cases of erosion, the orifices of a number of the labial glands will be found enlarged, the tissues around red and vascular, and upon pressure can be made to exude a thin watery fluid which is distinctly acid in character, as shown by its reaction with blue litmus-paper. It is further supposed that this acid, though secreted constantly, is by some observers regarded as inactive during the day, owing to its neutralization by the alkalies of the saliva, but that, at night in the absence of these alkalies, it exerts a decalcifying or disintegrating action upon the enamel. The lips are regarded as accessory agents, mechanically holding the secretion in contact with the teeth during the night and polishing them during the day. The tooth once decalcified falls an easy prey to the mechanical action of the tooth-brush. The various observations and experiments by which this knowledge has been evolved are the common property of the profession, and for which we are mainly indebted to Dr. James Truman[1] and Dr. E. C. Kirk.[2] In 1893, Dr. Safford G. Perry,[3] of New York, from personal experience and from the observations of patients, stated as his opinion that dental erosion is due to an excess of uric acid in the blood, and is to be therefore regarded as an evidence of the gouty diathesis.

According to Dr. Perry, systemic treatment will check the progress of the erosion, so that excavation and filling of the cavity is not always necessary. While the co-existence of these two pathological states is not to be denied, it is difficult to see how uric acid could give rise to a decalcification of the enamel unless it were excreted either by the salivary or mucous glands of the mouth. Dr. Perry, however, states that he has no proofs to offer that uric acid is present in the mouth or that it is this acid which causes the erosion, but he feels justified in asserting that that condition of the nutrition which predisposes to the production of uric acid gives rise to the particular acid of the labial secretion which does cause the erosion without stating what that acid may be.

The problem, therefore, which presents itself has several elements requiring solution. 1. What is the nature of this acid? 2. Is it capable of decalcifying enamel? 3. What is its origin?

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[1] International Dental Journal, vol. xiv., No. 4.

[2] Dental Cosmos, vol. xxix. pp. 55, 56.

[3] International Dental Journal, vol. xiv., No. 4.

The problem is a difficult one, and it is not with the idea of conveying the impression that the writer has solved it that he presents these observations to-night, but rather with the idea that lines of investigation may be suggested which others may pursue with success.

In the interpretation of any pathological condition, the primary essential is a clear conception of the anatomy and physiology of the structures involved, without which no progress can be made. Permit me, therefore, to direct your attention to the glands of the mouth in general and to the glands of the lips in particular. As is well-known, the mouth is abundantly supplied with glands which, in recent years, have received very considerable attention; they have been divided by Professor Heidenhain into two classes, which differ in the chemical composition by their secretion as well as in the microscopical structure of their secreting elements.

The glands of the first class or type secrete a thin watery fluid containing albumen, salts, and a ferment body. They have, in consequence, been termed albuminous glands. To this class belong the parotid, a portion of the submaxillary, and a portion of the glands found in the tongue and in the nose.

The glands of the second class or type secrete a more or less viscid fluid which contains but a small quantity of albumen and salts, but a relatively large quantity of an albuminoid substance termed mucin. These glands have therefore been termed mucous glands. To this class belong a portion of the submaxillary gland, the sublingual, a portion of the glands of the tongue, the glands of the cheeks, palate, pharynx, and lips.

The topographical distribution of the two types of glands has been very carefully studied in man and different classes of animals. According to Podwisotski, the albuminous glands preponderate very markedly in sheep, goats, and polecats; less so in the pig, horse, guinea-pig, fox, dog, hedgehog, and squirrel.

The mucous glands, on the contrary, preponderate considerably in the bat; less so in the armadillo, mole, and cat. Both types of glands are found in equal proportions in men, monkeys, and rats.

For the purpose in view, I will confine my remarks to the labial glands, merely alluding to the fact that all mucous glands in their structure are in all essential respects similar.

If the upper lip be removed from the body of an individual recently dead, and the skin and orbicular muscle be dissected off, the labial glands will come prominently into view. They are found most abundantly in the upper lip. Though arranged quite irreg-

ularly, they are more numerous towards the centre, less so at the extremities of the lip. The body of the gland is rounded, about the size of a small shot, and provided with a narrow duct which is sometimes twisted. These glands are held in position by connective tissue, furnished by blood-vessels and supplied with nerves.

A microscopical section of a labial gland shows that, as the main duct passes through the mucous membrane into the submucous tissue, it branches into two or more ducts, which terminate in enlarged alveoli. The wall of the duct is lined by low, granular, nucleated epithelium, which stains readily with carmine. In the beginning of the secretory part of the gland the epithelial cells are changed in character, becoming enlarged, columnar, glassy in appearance, and, as shown by their less readily staining with carmine, changed in chemical composition.

The function of the mucous gland generally is to secrete a mucous fluid which aids in mastication and deglutition, while that of the labial gland is to lubricate the surfaces of the teeth so as to permit of free and easy movements of the lips in articulation.

The chemical composition of the secretion of the mucous gland was determined some years ago by Bidder and Schmidt. According to these observers this fluid contains water, mucin, and inorganic salts, the chief of which is sodium phosphate, which imparts to the fluid its alkalinity.

Without going into unnecessary details, permit me to present a summary of the process of secretion, as it has been shown to take place in mucous glands in general. The raw material out of which the gland-cells elaborate the characteristic secretion is furnished by the blood-vessels surrounding the gland. As the blood flows through the capillary vessels the plasma passes through the capillary wall into a surrounding space known as the lymph-space. From this space the epithelial cells absorb those specific materials, which are transformed within the cells into mucin. The water and inorganic salts undergo no change apparently. According to the quantity of the blood furnished will be the supply of raw material. Hence during the periods of glandular activity the blood-vessels are enlarged, this enlargement being brought about by the action of vaso-motor nerves. Coincident with this increased blood-supply the gland-cells themselves are stimulated to increased activity by a special class of nerves, which may be termed secretory. As a result of both influences increased secretion immediately takes place. The nerve impulses exciting both blood-vessels and nerves originate in special nerve-centres in the medulla oblongata. These centres,

however, may be thrown into activity in two ways. First, from irritation at the periphery and transmitted through sensory nerves; second, by the character of the blood plasma which flows around the centres. With the cessation of the irritation the centres cease to act and the phenomena of secretion subside.

Here, as elsewhere, however, the pathological law holds good, that the existence of a continuous irritation causes permanent dilatation of blood-vessels and hyperæmia, impaired activity of the epithelial cell, and the production of an altered secretion. In the light of this statement, what does the labial gland present for our inspection? Certainly a change from a normal to an abnormal, from a physiological to a pathological state, as shown by the persistent hyperæmia, a secretion altered in viscidity, and changed from an alkaline to an acid reaction.

The questions which now arise are: 1. What is the nature of the acid here present? 2. Is it capable of decalcifying the enamel? 3. What is its origin?

As stated in the beginning of this paper, from the co-existence of dental erosion and gouty manifestations, an impression has become widespread that the acid in question is uric acid, and necessarily an excretion from the blood by the mucous glands. To this interpretation I must express my complete dissent, and for the following reasons:

In the first place, it would be a most unusual occurrence physiologically for a mucous gland to take upon itself the excretion of uric acid when the natural excretory organs, the kidneys, are in fair condition. In the second place, uric acid is soluble even in hot water only to the extent of one grain in eighteen hundred,—in other words, to the extent of one grain in four ounces of water. As the quantity of fluid secreted by a few diseased labial glands only amounts to but a few drops in comparison, the amount of uric acid must necessarily be small and insufficient to produce any destructive influence on the enamel. In the third place, uric acid is not, as its name implies, always an acid body. It is considered by chemists as an amphoteric body,—that is, one which is as frequently acid as alkaline, and often neutral. In the fourth place, uric acid is incapable both from its small amount and feeble combining power of decalcifying enamel.

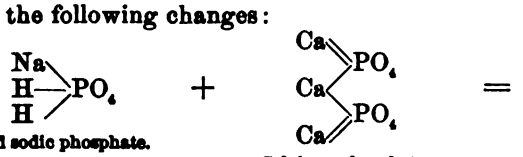
In answer to the first question, it may be said that the acid which is theoretically most likely to be present in the secretion is one derived from its normal constituents. It will be recalled that among the salts there is present in considerable quantity sodium phosphate, a distinctly alkaline salt. One of the peculiarities of

this salt is that it readily parts with one atom of its sodium when brought into relation with carbonic acid, when it becomes the well-known acid sodic phosphate.[1] The source of the CO_2 must be sought for in the metabolism of the gland-cells. In the normal activity of the glands the CO_2 produced appears to be insufficient in amount to bring about this conversion. But with increased vascularity and, in consequence, heightened cell activity, the production of CO_2 must be very considerably increased. Under such circumstances it is easy to see that it might combine with all the sodium phosphate with the production of the acid salt. The reaction would be as follows:

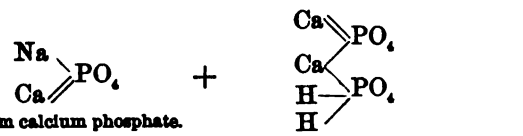
$$Na_2HPO_4 + H_2CO_3 = NaH_2PO_4 + NaHCO_3.$$

The presence of this acid, it must be confessed, has not been demonstrated, inasmuch as there are no known tests by which it can be detected when dealing with such small amounts. In looking at the list of organic acids which are capable of decalcifying enamel, this is the only one which apparently could come from a mucous gland.

Assuming for the moment that the acid present in the secretion is the acid sodic phosphate, the next question is, Can it decalcify enamel? The possibility of such a capacity is apparent from an examination of the following changes:



Acid sodic phosphate. Calcium phosphate.

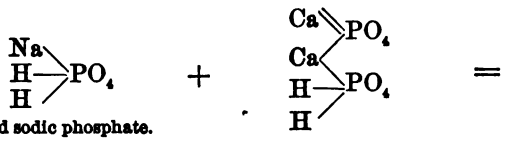


Sodium calcium phosphate. Acid calcic phosphate.

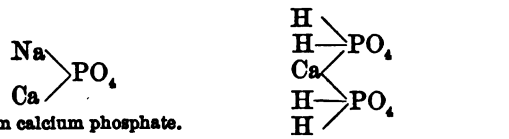
When a molecule of the acid sodic phosphate is brought into relation with a molecule of calcium phosphate, a double decomposition takes place. On the one hand, one atom of the calcium dis-

[1] Since writing this paper, my attention has been called to an editorial in the *Dental Cosmos*, June, 1894, by Dr. E. C. Kirk, on "The Oral Manifestations of Lithæmia." At the close of this editorial the writer states that the deposition of uric acid in or around the labial gland "might by its irritant action bring about an alteration of function of the gland which would cause it to secrete an acid mucus, the acidity of which would be due to some other substance than uric acid,—the acid sodium phosphate, for example."

places the two atoms of hydrogen, thus forming a compound known as sodium calcium phosphate,—an insoluble body. On the other hand, the two displaced atoms of hydrogen replace the calcium atoms in the calcium phosphate, thus forming in the enamel the acid calcic phosphate, which is more soluble than the original calcium phosphate. With the appearance now of a new molecule of the acid sodic phosphate from the gland, a further decomposition takes place as follows:



Acid sodic phosphate. Acid calcic phosphate.



Sodium calcium phosphate. Diacid calcic phosphate.

Once again the calcium atom of the newly-formed acid calcic phosphate is replaced by the hydrogen atoms, with the formation of the old superphosphate or the diacid calcic phosphate, which is very soluble. While the calcium atom combines with sodium and phosphoric acid atoms, and forms the sodium-calcium phosphate.

In this way it becomes conceivable how one by one the molecules of the calcium phosphate of the tooth are gradually disintegrated by being converted first into the mono and secondly into the diacid calcic phosphate.

To convert this theoretical possibility into an actuality I immersed the enamel of a tooth in a weak solution of the acid sodium phosphate, prepared for me by Professor Leffman. At the end of a week the tooth showed two small eroded spots and a number of transverse furrows due to the action of a tooth-brush which was used daily. In addition, the cutting-edges of the tooth show a distinctly eroded character. This simple test may not be very conclusive, but it must be remembered that it is difficult to realize the conditions as they present themselves in the mouth,—namely, a uniform temperature, continuous action, possibly for many months, continued action of the lips, the vitality of the tooth, etc.

In conclusion, I would like to suggest a method of treatment which might be of some value. Even admitting that the under-

lying cause is the presence of uric acid in the blood, and that the discharge of acid and the subsequent erosion can be arrested by an anti-gout treatment, it is, nevertheless, well known that with a return of the gouty condition there will be a re-establishment of the gland disturbance. Now if the gland, which is the immediate cause of the acid secretion, were removed, even though the gouty phenomena returned, there could be no further discharge of the secretion.

It has occurred to me that the diseased gland can be removed or destroyed by electrolysis, the method employed by the electro-surgeon for the removal of superfluous hairs. These practitioners employ for this purpose a small battery of cells, either the fluid bi-chromate of potassium or dry chloride of silver cells. The *negative* pole of the battery is provided with a fine platinum wire, which is carefully inserted into the hair-follicle. The *positive* pole is provided with a sponge electrode, which is placed in a small bowl of water. When the needle is carefully adjusted, the patient inserts two fingers in the water. After the lapse of a minute or two a white froth makes its appearance around the mouth of the follicle, which is an indication that the gland-cells have undergone decomposition. The hair can then be readily extracted. After this destruction of the follicle no hair will ever grow.

Now, if this same method were applied to the labial gland in the same way, their decomposition could be brought about with a total cessation in the discharge of any secretion. The lips could be easily everted, and by employing a bent electrode the orifice of the gland could be easily penetrated.

At the close of the paper, Dr. Brubaker exhibited a small chloride-of-silver battery, similar to those employed for generating electricity, and in removing superfluous hairs, and explained the manner of using it. By introducing the point of the needle into a hair-follicle, the current being applied, the bulb was destroyed. This the doctor did, as illustrating the manner in which the diseased glands might be eradicated.

While reading his paper, the essayist passed around for inspection some teeth with which he had experimented.

Dr. Peirce stated that he had examined the teeth before they were treated, and they were perfect, entirely free from any abrasion or cut.

Dr. Peirce asked Dr. Truman to open the discussion, and asked if the speaker's remarks were consistent with his experience.

DISCUSSION.

Dr. Truman.—It confirms my own view of the matter. I never could credit the uric-acid theory, and I am confident that what Dr. Brubaker has said in his paper is absolutely correct.

I am also pleased to note that we have some ideas in regard to what may possibly be one of the causes of erosion. I think the examination of the teeth indicates, as he has stated, that a plan of investigation might be satisfactorily carried out that would lead to some results. I don't see, however, that his plan of destroying the glands will help matters very much. If the glands in the lip are destroyed, what will be the effect on the secretion necessary for the mucous membrane of the lip? I would like to ask Dr. Brubaker to answer that question. The lip would become very dry and difficult to manage. It is difficult now, for some of us to talk in our lectures; but aside from that, I question very much whether the glands are really the cause of erosion, although his research is an indication of what may occur.

Dr. Brubaker has very kindly alluded to some work I performed in this direction many years ago, while endeavoring to discover the cause of erosion. I carried the experiments into the night season, satisfied that the day hours gave a neutral reaction, and that it was impossible to secure satisfactory results during the period of the greatest flow of saliva. And I think I proved conclusively, certainly to my own mind, and to the minds of some others, that fermentation progressed through the night, and that it was not possible in the daytime. Dr. Kirk's idea was different, and he experimented on the glands of the lip in the daytime, and demonstrated by the aid of litmus-paper that there was an acid passing from the glands at all times during the twenty-four hours.

Therefore, we may conclude that at night the acid would not be more effectual in destroying the tooth-structure than by day. But I am inclined to think from my own observations that at night we have increased fermentation independent of any glands, and that this also tends to the destruction of the teeth. I am very certain, from clinical observation, that these are facts, for I have stopped erosion altogether by the use of an antacid.

Of course, the question is as yet much in the dark; I acknowledge that, and I suppose every one else does. The erosion by the old style of wire clasps, used many years ago, produced precisely the same effect as the fermentation ordinarily occurring at night, fermentation taking place between the clasp and the tooth.

Dr. Brubaker answered the preceding speakers in the following manner:

"I am well aware if you destroy the labial glands and diminish all secretion the lips will become very immobile; but, as a matter of fact, there are probably never more than a half-dozen of the glands which are diseased. The specimen shows there are fifty or sixty present, and the destruction of even a half-dozen would not interfere very materially with the quantity of secretion."

Dr. Truman.—How would you know when a gland is diseased? What are the indications?

Dr. Brubaker.—The indication of which gland is diseased is shown by pressing upon the gland. As Dr. Kirk demonstrated, pressure upon the glands forces out of it a fluid which is thin, watery, and very different from the normal secretion. And also the orifices of the glands, I am told, are nearly always enlarged, showing redness and congestion.

Dr. Faught.—I listened with great interest to the paper, and still I cannot entirely believe that the uric acid explanation is done away with. I base that upon the assertion within the paper. The paper lays particular emphasis upon the fact that this derangement in the gland may be due to some internal irritation within the gland itself. So it would seem to me that we are now touching only upon the process which takes place at one end of the line, and that it may still be possible to look for uric acid as an irritant producing this pathological condition.

Dr. Gaskill.—I think I agree quite fully with Dr. Brubaker so far as my limited knowledge of the subject will allow. He shows that the marked action in most cases of erosion must come from the glands of the lip, although the use of acids for systemic purposes may also have a marked effect on the teeth.

I have had several cases, and reported one which was very marked, of the use of the "microbe-killer." It was a lady who came to me several years ago, and when she first presented herself I noticed that some gold fillings in the front teeth looked as though they had never been properly dressed down. I asked her if she was taking acid medicines, and she said she was using considerable of the microbe-killer. She brought me some, and I found it was markedly acid in action. When I saw a similar indication in the teeth of other patients I questioned them, and I found three others using it. The result was the same with all. There was the greatest wasting away, both on the cutting-edge and the palatine walls, while the labial walls were less affected, owing to the protection given by the lip.

The subject was then passed and Incidents of Practice were taken up.

Dr. Fish then exhibited a black diamond, set in a bar of steel, that he claimed was most efficient in truing up old corundum wheels, a small tap, most valuable and inexpensive, and some asbestos rope that could be used as a rapidly adjusted investment for crowns or small pieces of bridge-work where soldering was required.

Adjourned.

THE regular monthly meeting of the Society was held November 10, 1894.

After the close of the routine business of the Society, the President, Dr. Pierce, stated that Dr. Henry Leffmann would read a paper on "Hydrogen Dioxide as furnished to Dentists."

NOTE ON HYDROGEN DIOXIDE AS FURNISHED TO PRACTISING DENTISTS.

BY HENRY LEFFMANN, M.D., D.D.S.[1]

HYDROGEN DIOXIDE was for a long while a chemical curiosity, known only to a few special workers. I remember how, as a beginner in chemistry, I read with interest in one of the larger manuals the descriptions of the ingenious but tedious process by which Thénard prepared the substance, and also how much interest was awakened by its curious and exceptional properties.

Although we are still but little familiar with the pure substance, the dilute solution is now so well known that we are able to study all its important properties and utilize its valuable actions.

For several years I have kept a desultory analytical watch on the commercial solutions of hydrogen dioxide. I published in the *Medical News* over two years ago a short paper in association with Dr. William Beam, giving assays of the samples of the brands commonly sold. The examination was suggested to me by the editor of the *News*, and grew out of a paper by Dr. Wallian. In the examination a process of assay was used which had been devised by Mr. Marchand, generally accepted, and considered reliable. Dr. Squibb, however, who at one time used and advised the method, has since shown that it exaggerates the amount of available oxygen. Nearly two years after this paper was published, one of the firms from which samples had been obtained wrote me a long letter objecting to the results. I thought that it would be a good time to reinvestigate the matter, and accordingly published in the *Medical News* the results of a much more extended series of assay, covering twenty-one samples and including various tests.

The members of this Society are, I think, mostly familiar with

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[1] Professor of Chemistry and Metallurgy in the Pennsylvania College of Dental Surgery.

this paper, and I need not refer to it further than to say that it showed that while there are several excellent brands in the market, there are also many poor ones. The reputation of a house is no guarantee, nor is the price. Two samples from Merck's contained almost no dioxide. A sample which claimed as a special merit the small amount of fixed solids showed the highest in the list. Recently my attention has been called to an English brand much in favor with some physicians. I obtained a fresh sample (four-ounce bottle, retailing at one dollar), and found it to be of poor quality.

At the time the investigation of the twenty-one samples was made I had several prescriptions calling for one ounce of hydrogen dioxide put up in different parts of the city, and I also obtained samples from several of the dental depots. I was so struck by the inferiority of the latter set that I thought it well to bring the matter before this Society, but owing to my not communicating my desire to the Secretary soon enough, it could not be placed on the programme until after the article had appeared. Although a mere mention of the results in the direction was made in the *News*, I preferred to wait until a later period before reading a paper. When, therefore, I was asked by Dr. Faught to contribute something for this meeting, I suggested this topic. I have added a few facts this week, which show that there is still room for improvement.

Hydrogen dioxide solution should be a clear fluid, containing sufficient amount of the dioxide to give ten volumes of oxygen when completely decomposed. Fifty cubic centimetres of it should not require more than about five cubic centimetres of decinormal sodium hydroxide to neutralize the acid present. It should keep well in a moderately cool atmosphere. On opening a fresh sample no distinct explosion should occur, and when poured into a beaker very little effervescence should be noted.

The assay for volume strength is made by means of a solution of potassium permanganate. I need not describe it here.

I give the following figures as to hydrogen dioxide solution sold to dentists.

TESTS ABOUT FEBRUARY 16, 1894.

	Volumes.
Prescription from A. Robbins's drug-store, Eleventh and Race Streets	10.9
Prescription from drug-store at Frankford and Girard Avenues	10.9
One-ounce bottle, S. S. White Dental Manufacturing Company	5.1
One-ounce bottle, S. S. White Dental Manufacturing Company, second sample	5.4
One-ounce bottle, G. Sibley	0.5
One-ounce bottle, H. D. Justi	1.4

RECENT TESTS.

	Volumes.
One-ounce bottle, S. S. White Dental Company, first sample, November 10	5.04
One-ounce bottle, S. S. White Dental Company, second sample, October 30	5.3
One-ounce bottle, H. D. Justi, first sample, November 10	.56
One-ounce bottle, H. D. Justi, second sample, November 10	.56
Sample of Marchand's purchased at G. Sibley's, October 30	12.04
Samples of McKesson & Robbins's hydrozone, at least six months old, kept in photographic dark room, and opened to-day, November 10, no internal pressure, contains	9.1
Samples of McKesson & Robbins's pyrozone that has been standing in laboratory for at least six months, opened occasionally, showed	9.1
Pyrozone, when fresh, contains almost exactly	10.

I have tested also the acidity of the small samples noted above. They show a rather high acidity in some cases, but as the quantity available for test was small, it is hardly just to institute comparisons.

The above samples were all in original packages, and were tested when fresh. The one-ounce bottles cost fifteen cents,—a very high price even for a good article. Pyrozone, which is most expensive, ten-volume solution, in this market sells for fifty cents for four ounces, but the above samples are sold at the rate of sixty cents for four ounces. A ten-volume solution of excellent keeping quality is made by the Oakland Chemical Company, and may be obtained at retail at about sixty cents a pint. Such a solution will keep in an office for weeks without appreciable loss if a little care be taken not to place it in a warm corner.

There is no necessity for buying the material in one-ounce bottles, and there is also no reason that the large supply-houses should retail such inferior samples as above noted. Approximate assays are easily made at such establishments. A solution of potassium permanganate will last a long while, and but one cubic centimetre of a given sample of hydrogen dioxide is required for the test. Even, however, if this be thought too much trouble for the dealer, he can purchase guaranteed articles and retail them.

DISCUSSION.

The President.—You spoke of acidity and non-acidity. Could you give us any idea whether the acidity of Marchand's peroxide is sufficient to have any deleterious effect?

Dr. Leffmann.—The acidity in Marchand's peroxide amounted to about eight in the test made to-day against about four, which is

the minimum of the Oakland. The acidity of the pyrozone is about two for the same volume. Fifty cubic centimetres should not require more than five cubic centimetres of decinormal sodium peroxide to neutralize the acid present. Pyrozone shows about two, Oakland four, and Marchand's usually runs up to more than six or seven. To-day the sample, which was rather strong, ran to eight. If we were to dilute it to ten volumes it would reduce the acidity.

Marchand's article is undoubtedly being improved, and I think the later samples examined show a considerable decrease in the acidity, while the strength is greater.

A sample of Merck's, tested last February, was extremely acid. Two samples were obtained from different houses, and were found to have very little active oxygen (a little over one volume), but both very acid.

A sample of English hydrogen dioxide which I examined costs one dollar for a four-ounce bottle, and contains only about six volumes of active oxygen.

How imperfect must the treatment be that depends upon such inferior articles!

Dr. Deane produced a bottle of hydrogen dioxide, and said,—

"Since hearing this paper I would say I have here a bottle left by one of Marchand's men, and I used it in the ordinary way, and brought upon myself a great deal of trouble. I washed an abscessed bicuspid in the usual manner, and the patient not only lost the root, but the results were quite serious for ten days."

Dr. Leffmann asked if there were any of the material left.

Dr. Deane answered that there was, and Dr. Leffmann said he would be glad to take it and make an analysis of it.

Dr. Leffmann.—Dr. Thomas S. K. Morton received a sample of the Marchand article, left at his house by an agent, and it stood in a small side closet for some weeks. One of the members of his family became sick with diphtheria while at the sea-shore, and he was sent for. He thought he would take down, among other things, a bottle of hydrogen dioxide. He went to the closet and took up the sample unopened, and then, remembering the article I had sent him, packing up a bottle of Oakland hydrogen dioxide, he took the train. About thirty minutes after he left, the people in the house heard a violent explosion. They went to the closet and found the bottle containing Marchand's dioxide torn into powder, and two or three other broken bottles lying on the floor. The decomposition had started, and the gas had gone on accumulating

until the limit of pressure had been reached. Had that explosion occurred in his hands, it would probably have blinded him.

These accidents need not occur in properly made solutions. This sample may have been hydrozone. I find the hydrozone to contain a little less than thirty volumes.

I may say that so erroneous are the ideas on this point that when Dr. Wayne called upon one dealer, and at my suggestion asked for Oakland dioxide, he was told, "We don't keep it. Here is a brand that makes a big noise when you open the cork." That was a sign of decomposition. The best articles do not make a report upon lifting the cork.

Dr. Gaskill asked Dr. Deane if there was a fistula at the end of the root he referred to.

Dr. Deane answered that there was; that he was treating it from the outside through the fistula.

Dr. Gaskill.—Could you pass the fluid through the root?

Dr. Deane.—No; I was treating it from the outside.

Dr. Gaskill.—I used the sample, and used it very successfully, without any indication of trouble, and also found it valuable as a mouth-wash when there was inflammation of the gums. The patient used it three or four times daily in a diluted form, and after a few days the mouth showed a thoroughly healthy condition.

I forced it with the hypodermic through the root and fistula, and in twenty-four hours there was no sign of the opening to be seen on the gum.

Dr. Deane stated that he used it in two or three other cases, and found he was getting into trouble; that he had found the bottle always gave a slight explosion upon opening; and he thought if Dr. Leffmann, who had the bottle, would open it now an explosion would follow.

Dr. Gaskill stated that in his experience there was so much pop to it that the patient was startled, the cork being blown out onto the cabinet. He still used it, and with good results.

Dr. Faught.—I am sure we are all very much indebted to Dr. Leffmann for these accurate statements we have received in regard to hydrogen dioxide. I have used it in dental treatment, but my experience with the article has been largely in another direction. I began by using Marchand's solution, and always had a bottle of it in the house. I look upon it as a very good agent for application to the tonsils in their incipient inflammatory stages. I have one child who has a strong tendency to tonsillitis. Every winter he would lose his schooling and be in bed, while the younger children would

be more or less affected. I reached the conclusion that a little care on my part would obviate his retirement from school to bed, so I began by keeping a bottle in the house in a cool place; yet on going to get the bottle I would very often find the cork blown out, even where it had been wired down. From the suggestions of Dr. Leffmann I substituted the Oakland Chemical Company's product, and I have had most excellent results. That article I have on hand constantly, and about once a week, or two or three times, just as opportunity occurs to me, I call the boys up in the morning and make an examination of their throats. If there is the slightest thready depositions, as we often see in cases of tonsillitis, I make an application with a swab that morning and the succeeding morning. I look upon it as prophylactic treatment to prevent the occurrence of diphtheria, and have always utilized hydrogen dioxide in this way to destroy germs upon the tonsils.

Dr. Luckie said he would like to ask Dr. Leffmann what the chemical results would be of mixing bichloride of mercury with pyrozone or hydrogen dioxide solutions, and if a good germicide could be obtained from such a solution.

Dr. Leffmann.—I have never made the experiment, but would be inclined to think you could make the mixture of corrosive sublimate with hydrogen dioxide, and that you would get a very efficient germicide that way. However, hydrogen dioxide is a peculiar body, and does not always mix well with certain substances that in theory ought to mix with it.

Dr. Pierce asked Dr. Leffmann if he understood him to say that the poorer solutions obtained were simply hydrochloric acid diluted.

Dr. Leffmann.—Yes, hydrochloric or sulphuric acid. Those noted to-night contained ten volumes, or three per cent. One-half volume would be one-twentieth of three per cent.,—a very small amount of material. The acid in that is an important ingredient. In all commercial hydrogen dioxide there is an acid. It does not keep if it is neutral; it does not keep in an entirely alkaline solution, but the acidity ought to be simply sufficient to preserve stability.

A REGULAR meeting of the Odontological Society of Pennsylvania was held at 1228 Walnut Street, December 8, 1894, Dr. C. N. Peirce in the chair.

After the transaction of routine business, Dr. W. M. Sharp read a paper on "Dental Furnaces."

DENTAL FURNACES.

BY DR. W. M. SHARP, BINGHAMPTON, N. Y.

GENTLEMEN,—The subject of my paper this evening is a matter which ought to concern every practitioner of dentistry. It is safe, however, to state that a very small percentage are acquainted either in the construction of a furnace or its use.

If one should go on a tour of inspection through the dental offices of to-day, he would find a large number equipped in the manner I will attempt to describe.

In our profession we have classified our operations, and have named the one prosthetic, the other operative, the operations being equally important; and in our offices we have prepared rooms for each of these.

In the operating-room will be found either an oiled floor, or a beautifully carpeted room, pretty curtains, rugs, handsome furniture, the most modern operating-chair, all the electrical appliances, a dental cabinet that has within it an assortment almost equal to a dental depot,—innumerable instruments, excavators, elevators, illuminators, generators, and regulators; rubber-dam clamps for the proximal, distal, labial, lingual, and cervical portion of every tooth. Theoretically these are all perfect and necessary; practically a much smaller and well-selected assortment of instruments would meet all requirements. In such an operating-room there is no indication of superior mechanical ability; there is evidence that some one else has done the originating, and it only remains for the operator to study their application. In fact, everything of comfort and convenience may be found in this room to facilitate the success of the operation.

The mechanical room presents an entirely different aspect. Any room in the building is considered good enough for this purpose. A back room where there is but little light will answer. White walls, bare windows, cold, no carpet. In one part of the room there is a lathe, in another a plaster-can, some plaster in it

and a good deal on the floor, a bench or table covered with wax, impression-trays, scrapers, and old broken plaster models. On a table or in one corner there is standing on guard a vulcanizer. It looks well in this room, is strong, and would be stronger if it did not leak steam. With the exception of a few dishes and bottles, this is pretty nearly all that will be found. There is nothing inviting in the room; there is no interest; how could there be under such circumstances? In the office the very instruments of the operating-room have the look of superiority over those of the mechanical, while the mechanical instruments have the look of insignificance and have not the power to assert their importance; they are deficient in numbers and inferior in quality. Certainly there is a marked contrast of the one over that of the other. What has occasioned this lack of interest in this branch? for it was never intended that any part of our profession should be neglected, but there should be perfect harmony and an increased interest in all operations.

A little investigation and the cause is easily traced. Unfortunately some people have a most contemptible element in their nature. It is this feeling of superiority over his fellow, and a belittling of others and their vocations, where self-esteem knows no bound. In our profession we have a few of these people. They would have their patients understand that there is a vast difference in the operations of dentistry; that the care of natural teeth requires greater skill than does the mechanical operations. There are so many objectionable duties connected with that branch, and he prefers to let some one else do it, while he is entirely an operative dentist; he is working to give his patient the impression that he is in advance of the ordinary dentist. There are a good many operators of this class who have this feeling towards mechanical dentistry.

Certainly there are exceptions. Some have taken it up as a specialty; there can be no point raised against any man for making a specialty of any part of the profession; but when this is done, it never occurs to him to feel himself above other members no matter what success he may have in it.

There can be no doubt but this existing feeling has to a considerable extent interfered with the interests that would otherwise have been in this branch.

The principle reason, however, I think is due to thoughtlessness on the part of the dentist in not having more pleasant surroundings, more of the comforts and conveniences in this room. If one

is a mechanic, which he must be to successfully practise this profession, he will feel more at home in this work than at operating. If any man should feel himself superior to another, the mechanical man has far more reasons for doing so. One single successful operation of an artificial palate gives a dentist a standing that could not be reached in operative dentistry. The same may be said of an artificial nose, artificial ears, artificial teeth. The smallest fee charged for a mechanical operation is far in advance of the smallest in operative dentistry.

As regards the unpleasant duties in mechanical dentistry, there are none. If they refer to a little plaster of Paris on one's fingers occasionally, I can only reply, I would rather have my hands covered with plaster in connection with a case for which I was to receive one hundred dollars than I would to work over a nervous patient at the chair, the equivalent of time, on the treatment of putrescent pulps, and for which I would not receive more than one-fifth this amount.

Now, let us all elevate mechanical dentistry and attempt more difficult operations. There is a wide field for investigation and improvement in methods and appliances and possibilities for greater attainments. Once interested there is no greater fascination.

My idea of a laboratory is a room which is conveniently located, pleasant, properly lighted and ventilated, and windows trimmed, not necessarily with expensive material, comfortable chairs, carpet on the floor. I use Scotch cork carpet: this is noiseless and can be mopped, and adds much to the room. For furniture, this may be largely in the shape of cabinets for instruments and tables of operations. Don't buy cheap things; get something you like and you will always have an interest in it.

Be careful in your selection of instruments and appliances when you get them. No man can make a proper selection of instruments if he is not first familiar with the operation he is to perform; if he is, it takes but little explanation of the working of any apparatus for him to decide promptly whether or not it will be valuable in assisting him in his operations. If you think an instrument will be valuable, procure it; if you think it will not be valuable, do not get it because the dealer or agent says some popular dentist has one. It may be that his idea of instruments and yours differ. What would be successful in his hands might prove detrimental in yours; and because your results were not equal to his you would in all probability charge your failures to the apparatus, never stopping to consider the fault is with yourself. In the first place, perhaps

your knowledge on this subject is not quite as good, and that in trying to manage something that you are not satisfied with you lose interest. Fortunately we have a variety of appliances for making our artificial substitutes differently constructed but reaching the same end, which gives us a chance to choose that which is best adapted to meet the requirements.

Now, with care one may have his laboratory fitted out with appliances that are constantly in use. We will assume he has made a good selection of everything except a furnace. He will need something by which he can quickly and conveniently melt his zinc, lead, or to refine metals, to prepare his cases for soldering, to make a porcelain crown which he has carved for some special case, to make an aluminum plate, to make a porcelain bridge, or for the repair of porcelain, or to bake the teeth which he has carved for special cases, and to make continuous-gum teeth. For each of these operations he will require heat. Since in our variety of dental furnaces there is made a separate one for each of the above cases, it might be thought necessary by the inexperienced to purchase one of each kind so that he would be fully equipped. In my judgment I do not think this necessary.

The most desirable is that which is so constructed that it will make laboratory work light and convenient, and will give opportunities for the greatest range of uses in the shortest possible time.

The most desirable fuel will be that which is most prompt in action, the least objectionable to work with, and which is controlled without fear of endangering one's self in its use, since the results will be the same when the desired temperature is reached.

The success of the operation will therefore depend upon the construction of the furnace, together with the manner in which it is operated, with little reference to the combustible used. In this direction I recommend your investigation in selecting your furnace.

The study of combustion will settle this question for you and fit you to scrutinize to your entire satisfaction the most complicated furnace.

Except for use in connection with porcelain work, there is practically no need of inquiring into detailed construction, for it matters not whether they have been built with a view to having perfect combustion or not, if only the temperature can be reached and they are otherwise satisfactory.

Porcelain is highly sensitive to certain gases and to foreign matter, so that there is provided a chamber or muffle which pro-

tects it from the direct influences of the fuel used. Cases injured from this cause are termed gased.

Let us consider the furnace which has been in use the longest time and is in some respects the best. It is the large coal furnace which is in every college building and with which you are familiar. In the centre of this is a large space for coal, with a clay muffle stretching across from one side to the other. The great amount of coal or coke surrounding the muffle furnishes a steady volume of heat which is necessary to get the best results in porcelain work. No better work has ever been done than that made in this style of furnace when the management has been good. But the inexperienced will gas his work every time, until he learns that he must attend to the draughts and get his fire in proper shape before he commences his baking. If one is doing a great amount of this work, sufficient to keep it running a full day at a time, and has plenty of room to keep it in and is indifferent to the temperature of his room while working, this will do the work perfectly.

For me to go into detail on the construction of the different furnaces now in use for this purpose, it would seem unnecessary, since I have made a careful study of the underlying principles and have endeavored to present them as they appear to me, and since I have brought with me a furnace of my own construction which will convey to you my ideas on this subject better than I could otherwise present them.

At the conclusion of the reading the furnace was exhibited.

This furnace is built of clay, and is of sufficient thickness to give volume of heat as well as the necessary temperature. In this respect it is fully equal to the coke or coal furnaces, while all discomfort and dust are avoided.

Besides its great value in continuous-gum work, it can be used for melting zinc, lead, or aluminum, and also affords a ready means of heating a case preparatory to soldering.

Dr. F. A. Coney read a paper on "Carving of Block-Teeth."

CARVING OF BLOCK-TEETH.

BY F. A. CONEY, D.D.S., DOYLESTOWN, PA.

HAND-CARVED blocks have the merit of being the most natural-looking and at the same time, when well mounted, the strongest artificial teeth made. When the best results are desired, and neither time nor cost are objects, carved blocks are the best recourse of the dentist.

It is here that the carver has an opportunity to carry out his conception of a very difficult and peculiar case. The teeth can be placed in any position or inclined at any angle deemed desirable. The natural expression of a carved block is seen in the bolder curves and contours made by the skilful hand, which it is impossible to produce from brass moulds.

The following is a description, in detail, of the carving process in general use from about the year 1850 to date:

The first step is to get a perfect impression, and a bite for an upper or lower, whichever space the piece is intended for. The simplest and shortest method of getting a bite for small partial cases is the following:

Take a roll of beeswax—or modelling composition, which I prefer—from one to two inches long, according to the number of missing teeth, and about three-fourths of an inch thick. Soften in hot water, bend into a semicircle, and press it against the teeth on each side of the space or spaces requiring substitutes. Then direct the patient to bite through the wax until the cutting-edge and cusps touch and occlude naturally. After pressing the wax or modelling composition against the labial or buccal surfaces of the teeth, carefully remove it from the mouth, and harden it in cold water.

Now, then, take water and plaster and mix it quite thin. First fill the imprints of the teeth in the wax or modelling composition, and work the plaster into said imprints. As the plaster stiffens build it up and extend it back over the palatine surface, and about one-half or two inches beyond said impression. That will give the upper part of the model. Trim it to the desired shape to handle conveniently. Now sandarach or shellac the plaster exposed to view, then oil the model and bite with sweet oil. The next step is to run the lower part of the model with plaster. When plaster is set, put said model in hot water to soften the wax or modelling composition.

When soft take it apart, and you have the model of the mouth to carve your block by.

The next step is to enlarge the cast. If it is to be a block of two teeth, cut from the approximate surface of each tooth of both sides of space to be filled about one-half of a sixteenth of an inch. This will give the shrinkage for said block.

For a block of four teeth you proceed in the same manner as for a block of two teeth, with the exception that you take from the approximate surfaces one-sixteenth of an inch from each tooth,

thus allowing a greater shrinkage for a block of four teeth than for a block of two teeth.

For a block of six teeth, you proceed in the same manner as you did for the block of two or four teeth, allowing, of course, for a greater shrinkage, according to the case you have in hand.

Now prepare in a small tin cup spermaceti, melting over a spirit lamp until it becomes liquid. Add enough Chinese or red vermilion to color it to a cherry red. Then take the liquid spermaceti and paint with a camel's-hair brush your impression model, the space between the canines. If it is to be a block of four, also paint the canines. For a block of six do the same as for a block of four, in the same manner for all models which are used for carving of teeth.

Apply with a camel's-hair brush sweet oil over the antagonizing model or bite, so the bite will separate from the body without drawing it.

I use Lukens's body, prepared by S. S. White. It is the strongest body known, and fuses at the highest heat. This body I mix in a porcelain bowl or wedge-wood mortar by adding water to it to make it the consistency of putty. It is now ready to be packed or worked into the model. When the model is full of body, dry out the body on a muslin cloth so as to absorb the moisture which arises on the surface; it also makes the body more solid and firm. It is then ready to begin carving.

The carving instruments are known as a string-bow, carving-knives of different shapes, one bone spatula, pin tweezers, and camel's-hair pencils.

Before commencing this process the size and shape of the teeth must be decided upon, the perfect form of the ideal teeth must be in the mind's eye. The width of the teeth is then marked off on the block, beginning at the central or median line, the desired width and height. With the straight carving-knife, and by cutting an inverted V-shape between the teeth, the necks are carved in a semicircular groove, not deep; have them to incline towards the centre equally on both sides.

The model is now reversed, and the points of the gum between the teeth are carved down, and then the body is added to each tooth to bring it up to the desired shape and size, and to look as natural as possible. The gum is then carved the desired thickness, and also to give shape to the block. The palatine surface of each tooth must be carved so as to antagonize with the opposing teeth.

A recess must be made in the block for the pins. The pins are then inserted, and body worked around them.

Now comes the difficult part. To take the block off the model, heat the block over the flame of an alcohol-lamp (a large one preferred) until the spermaceti is all melted from underneath the block. The greater part of the spermaceti will be absorbed in the body. It will then be loose on the model. Now drop the block on a piece of cotton, and be very careful not to let it have too great a fall. While the block is cooling, which takes about five minutes, take a slide and put a sufficient amount of kaolin, say about one inch in height and enough in width to lay the block upon. Pick up the block with the thumb and forefinger and place it with the palatine surface, or pin side, on the kaolin. Now make about half a dozen cone-shaped pieces with the body, about one inch high. These are to be used as trial pieces.

The block is now ready for biscuiting. Biscuiting is the hardening of the block in a red-hot muffle. The furnace used for biscuiting and baking is an ordinary two-muffled furnace, purchased at any of the dental depots. First put wood in the furnace, then put the slide containing the block in the back part of the lower muffle, leaving the door open for the escape of the smoke which arises from the grease in the block, then start the wood to burning and put on about two or three bucketfuls of coal. Now, when looking at the block in the muffle, the teeth or block will be found to have turned black, caused by the grease in the block being burnt out.

As the fire increases, the muffle becomes red on the inside; the teeth will then resume their former shade; at this stage close the muffle-door, and wait until the muffle comes to a bright-red heat; then take out a trial piece and with a penknife cut to see if it is as hard as pipe-clay. If so, it is time to remove the slide containing the block from the muffle; check the fire by removing the stoppers on the sides and top of the furnace. When the block is cool remove it from the slide, brush off the kaolin, and transfer the block to the model. It is now ready for enamelling. Enamels are technically called neck-, point-, stain-, and gum-enamels.

The enamels are then applied to the block with camel's-hair pencils by holding the block-teeth upward. Enamels should be mixed with clean water in a small glass or porcelain cup, making a cream-like solution. The neck-enamel is applied first at the neck of the tooth, extending half-way up the teeth towards the cutting-edge or point. The neck-enamels vary in color from bright yellow to dark brown. Now apply the point-enamel on the cutting-edge of the

tooth, and bring the point-enamel down over the neck-enamel, so as to overlap or coalesce. The point-enamels vary from white to different tints of bluish gray and yellow. The gum-enamel is applied to the points between the teeth with the carving-knife; the rest of the gum-enamel is put on the block with a camel's-hair pencil, care being taken to place the gum-enamel close to the necks of the teeth, but not to overlap the neck-enamel. It is not best to make the gum-enamel very smooth; it fuses at a little lower heat than the point- and neck-enamels, and is apt to become glassy.

The festoons around the necks of the teeth should be ridged, so as to make them more natural-looking and give them a certain prominence and individuality of their own; so the teeth will look as if they had grown out of the gum naturally. Many blocks are ruined by not having the gum-enamel applied properly.

After the enamelling is all done, prepare a slide the same as was done for biscuiting, with this exception,—instead of laying the block pin-side down on the kaolin, place the block perpendicular, the cutting-edge of the teeth upward; enamel your trial pieces at the points with gum-enamel, and place them on the slide in front of the block. Now all is ready for the final baking.

Place in your furnace the side stoppers, add coal to the fire, and fill the furnace with fresh coal; then put in the upper stopper, close all openings around stoppers with fire-clay mixed with water. When the lower muffle is at a white heat the slide is then grasped with a pair of long tongs, the ends of which are flattened for this purpose. The slide is lifted and held before the muffle for about two or three minutes, or until the block is thoroughly dry, then put the slide into the fore part of the lower muffle and gradually move it towards the back part of the muffle. When you reach the baking part, which can be distinguished by the intense glow or white heat, close the muffle-door, and give the block about ten minutes' time; then take out a trial piece with the tongs, and examine to see if the trial piece is fused or glazed enough; if not, bake about three minutes longer, take out another trial piece, and if it is fused and glazed enough, the block is done.

Now take the stopper out of the upper muffle; draw the slide from the lower muffle and pass it quickly into the back part of the upper muffle; close up the muffle with the stopper and close all openings with fire-clay; draw the fire and let block remain in the annealing or cooling muffle until cold. When cold the block is ready for grinding, which all blocks require more or less. Take a new impression and make a cast or model to grind the block to fit. To

facilitate the grinding, the prominent parts of the cast are coated with a mixture of red vermilion and sweet oil which will spot the under side of the block and show the exact place to be ground off to make the block fit solidly on cast. After this is done it is ready to be mounted upon any base the operator may wish.

After both papers had been read, Dr. Peirce, the president, called upon Dr. D. D. Smith, of Philadelphia, to open the discussion.

Dr. Smith responded as follows:

Mr. President and gentlemen, there is little, it seems to me, that can be said upon a subject like this. Thirty years ago, and even later than that, we should have taken a great deal more interest in carving block-teeth. It has been said that there have been no advancements in the line of mechanical dentistry. This seems to me to be a mistake, for there have been a great many improvements made in this branch, and especially in the line of artificial teeth.

For one to be fully skilled as a carver of teeth requires an apprenticeship and experience which very few men are willing to give to it. It does not take a high degree of intellect, but it takes a manipulative finger, which belongs to very few practitioners of the present day.

So far as I know, since Dr. Barstow passed away, there is but one man in the city of Philadelphia that makes any special practice in carving block-teeth. There is scarcely a student but will show you specimens of his carving, but they are simply specimens. They make them possibly in their college course as a matter of curiosity to see what can be done, and immediately on receiving their degrees they forget all about the dirty furnace-work,—for there is a certain amount of dirty work connected with a furnace of any description. I have had at least twenty-five years of solid experience in making continuous-gum work. But my young friend here who read the paper—an admirable paper—cannot tell me a single thing about the management of a furnace. He can tell me a great deal about carving teeth, but it is impossible to make furnace work clean. If you use the old-style furnace, you must go where there is a draught; you must go to the cellar, where the chimney is longest. Now, to go into the cellar a man must don old clothes and overalls, and he must go himself; he cannot send a student or an assistant, if he would have the work done carefully.

The carving of teeth, in practices such as the gentlemen of this city are engaged in, is largely time wasted. Not only on account

of the things I have mentioned, but because we can go to our dental depots and get almost everything there. Twenty-five or thirty years ago we could not find the line of teeth in the dental depots that we can find to-day, and when we look them over carefully we see that an incredible amount of thought and care and experience has been bestowed in that direction. Throughout the whole domain of ceramic dentistry there has been a constant upward tendency, and it has not been done by men highly intellectual, but by unskilled labor, with the various steps specialized. For dentists who are educated to-day, who have three years in a dental college, I do not advocate nor believe that it would be well for them to spend their time in the work of carving teeth. The province of the dentist to-day is to combat the diseases of the natural teeth. In a city like Philadelphia there are only about two hundred thousand out of one million who know anything of the benefits of dentistry whatever, except extraction. This is a condition of things that ought not to exist. Though we have three dental colleges filled with dental students and the paraphernalia for advancing the dental profession, still I say that dentistry would take a step backward if all the young men were compelled to give the time to acquire this handicraft and skill.

As the gentleman read the paper I was impressed with the thought of all the manipulations that enamelling teeth involved. He could tell you that it took five years of pretty close practice before he could enamel a set of teeth and get a result that was anyways satisfactory to him the first time.

I know what a difficult thing it was to carve teeth and to crown the *gum-enamel* in such a way as to bring good results after the case was fused; and a dentist can hardly expect to put the enamel on and bring out any such delicate shades as we find in the dental depots at the present time. I do not say but that the teeth are poor enough; there is ample chance for them to be improved, but there has been a great advance in this regard in the manufacture of teeth. We ought to have those who are qualified to do this carving. As dentists it is not necessary for us to do these manipulations, but it is necessary for young men to have a little experience to be able to tell what they want to a mechanical dentist. A single mechanical dentist could make all that we would need in Philadelphia. Why should we devote ourselves individually to this class of work? Let us look to combating the diseases that are incident to the natural teeth.

In regard to the furnace, I would like to see it in operation.

The one at the American Dental Association was new; I should say from the looks of this that it had been burned. Have you tested it enough to know whether it will do the work you say it will?

Dr. Sharp.—Yes, sir.

Dr. Smith.—Every practitioner who cares to do mechanical dentistry can learn now to do continuous-gum work, although it is more difficult than the carving. The results are more uncertain and always will be until we get some different material for the base of continuous-gum work. With this furnace the work is remarkably simplified. This is the first gas furnace that has ever been called to my attention which would do the work. We need volume as well as intensity. We have had intensity but not volume which would be necessary to satisfactorily fuse the material. I have lightened continuous-gum work by using thin plates up to No. 31, so that it would bend in soldering the teeth. About two years ago I sent especially to England for some palladium to get rid of the platinum or heavy metal, for the weight of it lies in the metal largely. I washed the palladium, knowing it was infusible, but I did not know its working qualities under heat. It has the same specific gravity as silver. It has the appearance largely of platinum, a little duller in color when polished, a little more blue. It has more the appearance of aluminum. The palladium necessary for a case cost twenty-two dollars. When sufficient heat was brought upon it to fuse pure gold, at 2012° F., a slight oxidation appeared and the blue color in the polished palladium became tarnished. After soldering the case (it took the solder well) in the repeated fusing the solid material became porous and the oxidation came out very distinctly and colored the body all through with a bluish stain so that I could not overcome it with the enamel. It had not that spotty appearance which the platinum has when it is soldered with alloyed gold. I made the case over with platinum, and that is the best we can do. I think there is no other metal on which you can count for continuous-gum work. You can work No. 29 platinum in connection with continuous-gum work, but thinner than that will cause failure.

Dr. Truman.—While I agree with my friend Dr. Smith in his general remarks, and feel that his statement is exactly true that we must aim for something that might be called higher work, still as he has a love for continuous-gum work, so I look back with feelings of pleasure to the time when I had to do mechanical work. I feel that there has been a weakness in dentistry of later years.

Ever since metal work was practically abandoned by the general profession we have experienced a loss in the direction of mechanical dentistry, and while bridge-work and crown-work has made it up to some extent, the profession, as such, cannot begin to compare to the days when we were obliged to work gold and silver entirely.

Now, it is a pleasure to me to listen to a paper by a man who comes forward at this late day to advocate block-work. In my recollection as a boy and as a young man, it was one of the most unpleasant parts of dentistry I had to do. As Dr. Smith says, first carve your teeth, biscuit them, etc., then go down into the cellar and burn them, and sit there until that process is accomplished; after that go on day after day and week after week making porcelain teeth. I have no desire to go through it again, yet at the time I had a feeling of pleasure that would almost make me wish to do it again. And I agree with Dr. Smith, if we only had some man who would be willing to do this class of work in conjunction with other kinds of mechanical work exclusively, it would be a great benefit to the profession to-day. As he has stated, there is no one in Philadelphia that does that work. We need them. We cannot always get satisfactory teeth at the depots.

Dr. Faught.—I would like to ask Dr. Sharp if the platinum muffle has any advantage?

Dr. Sharp.—I have given that some study. Personally I feel that I could get as good results from clay as from platinum. I will give a little demonstration, which I think will be valuable. I have with me a little piece of platinum plate, which I had intended to use in baking the porcelain this evening, but the gas has not been sufficient, and I will use it for this purpose.

In my research or inquiry of the different metals, I find it is a fact that hydrogen will pass through palladium and platinum by diffusion at red heat. This is not so when platinum is cold. I think I will prove this assertion to your entire satisfaction. For that reason I have my doubts about it being superior to clay in continuous-gum work when there is perfect combustion in the furnace. As the hydrogen gas comes in contact with the metal it takes atmospheric oxygen from the atmosphere and produces combustion in the pores of the platinum. If I heat this platinum red hot, and allow it to get partially cooled, and then replace it over the unlighted gas, it will gradually get red and ignite the gas, again showing there is combustion of the gas going on in the pores. (The doctor during this description held the piece of platinum over the gas-jet until it became red, then took it away from the jet

and allowed it to resume its natural color; then holding it over the escaping gas again, the flame having been blown out in the mean time, the metal became so hot that the gas was again lighted.) This is good proof that combustion of oxygen is going on in this metal. I don't think there is any advantage whatever in a furnace having a platinum muffle. The disadvantages are that it is very expensive; does not give volume of heat; if the least trace of zinc or lead gets on it by accident, it will be spoiled.

THE regular monthly meeting of this Society was held January 12, 1895, President Dr. C. N. Peirce in the chair.

At the conclusion of routine business, Dr. Joseph Head read a paper entitled "Plastics as a Bar to Bacteria."

PLASTICS AS A BAR TO BACTERIA.

BY JOSEPH HEAD, M.D., D.D.S., PHILADELPHIA.

"THE perfect filling must be water-tight," so says the time-honored axiom.

But a tooth is everywhere permeable by moisture, as can readily be demonstrated by dropping it, when dry, into aniline ink. It will be stained through and through.

One can hope to put a water-tight plug into a wet sponge quite as readily as into tooth-structure that is moist throughout. Thus we find that neither the axiom nor the filling will hold water.

Should we not rather say that, though a filling leak, it may still be perfect if it exclude germs of decay?

On superficial observation it might be thought that wherever moisture could penetrate so could bacteria; but this does not seem to be the case, as bacteria have not yet been found in normal dental tubules.

Before decay can take place some free acid must first decalcify the enamel and the orifice of a tubule. In this enlarged opening the bacteria may enter, when devouring the gelatin it excretes acid, which, dissolving more of the lime salts, allows the germ to penetrate farther in (Sudduth).

The ideal filling would be composed of a material that is water-proof, bacteria-proof, adherent, and a non-conductor of heat. And, moreover, a material that can readily be placed in the cavity without the slightest danger of marring the enamel edges.

With such a filling in position, the tooth would be as likely to decay as it was before decalcification occurred.

But we have not yet found the ideal filling-material.

Gold, while it can be made to exclude bacteria from its own substance and from entrance at the edges of the filling, is a good conductor of heat, and can only be sufficiently hammered to make a perfect seal in teeth of dense structure. There is no doubt that gold can be made water-proof, as the Bonwill mallet has demonstrated time and time again. Teeth have been partially contoured

one day and completed the next, perfect welding having been accomplished after the thinnest film of the moistened gold has been removed. But soft-foil fillings that have such a record for preserving teeth have been put in under water with lasting results. Does this filling preserve the teeth by starving out the micro-organisms? This supposition can hardly hold, as soft-foil fillings have been removed from cavities in a punky, evil-smelling state by means of the explorer, and the dentine beneath appeared sound and dense.

Tin would seem pervious to moisture, as any old filling can readily be separated into portions that only partially adhere. It has not been proved, one way or the other, whether it admits bacteria; but at least it can be said to preserve tooth-structure in a manner very similar to soft foil.

Amalgam in itself is water-proof, but leaks at the cavity margins.

Each year we hear of some wonderful alloy that will not shrink from the walls; but, in my opinion, that amalgam has not yet been discovered.

Reducing the mercury to a minimum will do much, but it has been my experience that amalgam fillings of my own and those of my fellow-practitioners all show some slight shrinking from the enamel after the space of some five or six years. But even granting that all these fillings had been badly put in, we still find, when the bulging edges have been trimmed, that in spite of a palpable leak in many instances the cavity remained sound. It may be affirmed that metallic rust gets into the tubules and protects them. That is certainly some sort of an explanation, and yet it can hardly be accepted as conclusive.

Oxychloride of zinc and oxyphosphate of zinc, although adherent to the tooth walls, are readily penetrable by moisture and bacteria.

Gutta-percha, although practically if not absolutely impervious to moisture, invariably leaks at the cavity margins.

My experiments with gold, tin, and amalgam are not yet completed, and so it is possible only to deduce from facts that are clinically well known; but the assertions just made concerning the cements and gutta-percha seem to have been proved in the following manner.

Cones of oxychloride of zinc and oxyphosphate of zinc were made, having a hollow place within that was absolutely excluded from the outer air. Harvard and Peirce's oxyphosphate of zinc was

used that became hard as ivory. Some of the oxychloride of zinc cones were made from calcined powder, some from the uncalcined. Those made from the calcined powder became extremely dense.

These cones were sterilized in a steam bath by the intermittent process in the following way: First, they were boiled in water two to three hours; then removed from the bath and placed in glass jars, the mouths of which were closed with absorbent cotton, and subjected to steam over the water-bath for one hour.

They were then allowed to cool for seven hours in an atmosphere of about 70° F.; again subjected to steam for one hour, and cooled over night. Next morning again heated for about an hour. Allowed to cool eight hours. Four hours steam heat, twenty-four hours to cool; one hour steam heat, allowed to cool, and then placed in a bath that after being first sterilized had been tainted with a decayed tooth. At the end of five days' immersion they were taken out and opened. The bouillon had filtered through the substance to the hollows inside. The bouillon found within was swarming with micro-organism.

The steam bath did not have the slightest effect on the oxychloride of zinc, but the oxyphosphate, from being very dense, seemed much softened. This might seem to depreciate from the value of that particular experiment; but it would still seem probable, if the micrococci could pass through strong oxychloride, that they could also pass through the oxyphosphate, that is so similar to it in substance.

On drying the opened oxyphosphate cones, small, shiny crystals lined the inside, which looked not unlike free phosphoric acid that had not become chemically united with the powder. And yet the cones before boiling were extremely dense.

The experiments with gutta-percha were as follows: Three canine teeth were taken and opened from end to end. The surfaces of the canals were thoroughly drilled away. One end of each was filled firmly with gutta-percha. A small pellet of cotton soaked with sterilized broth was then placed in the canal. The remaining openings were then dried and filled with gutta-percha. These were sterilized as follows: Two and a half hours in steam bath, four hours to cool, one hour in boiling water, two hours in steam bath, seven hours to cool, two hours in bath, two hours to cool, and placed in tainted broth for five days.

At the end of that time they were taken out, dried, and passed rapidly once or twice through a Bunsen flame. The gutta-percha was then removed with a heated instrument, the cotton was taken

out by tweezers previously sterilized in the flame, placed on a clean glass slide, and wet with two drops of distilled water. This water was then found to contain large numbers of bacteria.

If these facts are so, and the evidence would seem to indicate that they are so, what becomes of the fundamental principle involved in the statement that the edges of a filling must be bacteria-proof.

We know that cohesive gold fillings are almost if not quite certain to admit decay if the edges are not thoroughly tight. Then necessity for bacteria exclusion would seem not to entirely hold in the case of soft foil.

It may or may not be necessary with tin. It certainly is not absolutely imperative in the case of amalgam. With cement and gutta-percha it also does not seem to be an essential to tooth preservation.

And yet all of these filling-materials save teeth, and save them well. Especially is it the case with cement and gutta-percha, that stop decay when nothing else will. These last preserve the cavity walls, and yet allow the bacteria to enter. This seems a paradox, and is difficult to explain. One might say that bacteria need air and food; that cement and gutta-percha shut the germs off from these necessities, and thus render them dormant. But this does not to my mind reveal why some soft, spongy, malodorous soft-foil fillings have preserved the dentine beneath from further decay.

The experiments just reported may seem to be a means of deducing new and startling facts, but in reality this is not so. Soft foil and amalgam foreshadowed these conclusions many years ago.

I should like to add one word for those who shall ever wish to sterilize teeth for bacteriological research. Do not do it in a vulcanizer under steam pressure. I placed fifteen teeth carefully prepared in a vulcanizer, and kept them there for one hour at a pressure of thirty pounds, temperature 260° F.

When they were removed almost all the albuminous material had been extracted. They would have served as excellent specimens wherein college students might easily and readily examine the position and size of the canals, but were hardly suitable for bacteriological experiments.

In closing I would express my thanks to Miss Byrnes, the Fellow of Biology at Bryn Mawr, who not only placed the requisite apparatus at my disposal, but also gave valuable advice and assistance.

DISCUSSION.

Dr. Brubaker.—I hardly think I have anything to say on this subject. The first fact to be considered is, Does the fluid in the tooth that is filled pass through the filling to the interior of the tooth? And, secondly, assuming the fluid does pass through the tooth, is it likely that bacteria will follow the fluid? Might it not be possible that fluids can go through without conducting bacteria. Of course, these bacteria can be readily seen by a sufficiently high-power microscope. I would like to know what power lens the essayist employed to detect these bacteria.

The Pasteur filter is composed of clay that has been burned. We find water will pass through it under very considerable pressure, but after three months continuous use bacteria will be found in enormous numbers on the outside of that clay; but it has been almost impossible ever to find bacteria on the inside of it. And this is true not only of water, but of beef broth and a great many other fluids.

Therefore, the only fact in this paper which I see is, first, the demonstration that fluids pass through the teeth; secondly, the demonstration of bacteria going through with the fluids. The writer states that they have gone through. He does not state what kind of bacteria.

Dr. Head.—Single micrococci, two joined in dumb-bell fashion, and large numbers of colonies. Miss Byrnes, the Fellow of Biology of Bryn Mawr, also examined them, and it was she who really had to decide whether bacteria were present, and on the examination of each cone she saw them. We had an immersion lens, magnifying eight hundred diameters.

If there is any microscopist in the company who doubts the presence of bacteria, there are still some unopened cones in the bouillon which I shall be very glad to put at his disposal.

Dr. Smith was called upon, but did not respond.

Dr. Faught.—I have nothing to say in addition to the scientific character of the paper, but desire to express my appreciation. Such a subject requires going over very carefully in its details before one can speak with any accuracy upon it, and it is valueless unless it is accurate. In looking it over I do not, at the first glance, see anything that could be questioned, unless it was the question of sterilization, and I would not like to raise that, because the method employed seems to be thorough. We have not only the testimony of Dr. Head, but also the additional testimony of

learned authority, which points to its having been carefully and accurately done. This is a paper that would bear discussion at a future date more than at the present time, after some one had had an opportunity of verifying the cones enclosed.

Dr. James Truman.—This paper seems to me a mere question of fact, and one that we cannot well discuss. I cannot understand how micro-organisms can enter into cement fillings, or fillings of tin, gold, or amalgam, and yet those fillings preserve the teeth. That is the only point that seems to me objectionable in these experiments. I think it requires further work. If micro-organisms, if pathogenic germs, enter through fillings, how is it possible that fillings of that character preserve the walls. I have no doubt at all that these enter some fillings; but I cannot comprehend how this is possible with cohesive gold thoroughly packed. If that filling is flush with the walls, it must be preservative. The question is whether it is possible to absolutely make a malleted cohesive gold filling flush with the wall so it will prevent ingress of micro-organisms. I do not regard it as impossible, but it is very difficult.

But if micro-organisms penetrate into the plastics, as they seem to have done in the experiments of Dr. Head, the question arises, How is it that fillings preserve the teeth? But this is a question foreign to the paper. He has simply demonstrated a single but a very important point, that micro-organisms can enter into a plastic filling. Now, we know that in the oral cavity there are many kinds of germs, pathogenic and non-pathogenic. Whether a certain kind of micro-organisms can enter into fillings of this character while they prevent the ingress of others that are destructive to the tooth-structure needs further investigation.

Dr. Head.—There is one point apropos of what Dr. Truman has just said. The bouillon was sterilized first, and then inoculated with the decayed tooth substance. So it would seem that a large part of the germs found were the germs of tooth decay.

Dr. Peirce.—As Dr. Head has two or three cones yet unopened, I would like to suggest that one be given to Dr. Truman and one to Dr. Brubaker, and so enable them to report on their contents at some future meeting.

Dr. Broomell then read a paper in defence of an article which was criticised by Dr. William H. Trueman in the INTERNATIONAL DENTAL JOURNAL.

REPLY TO DR. W. H. TRUEMAN.

BY DR. I. NORMAN BROOMELL, PHILADELPHIA.

MR. CHAIRMAN,—I ask a few minutes of your time in which to make a short reply to Dr. William H. Trueman's paper published in the December number of the INTERNATIONAL DENTAL JOURNAL, p. 761. In his address the doctor took occasion to refer several times to a recent article read by myself before this Society (INTERNATIONAL DENTAL JOURNAL, October, 1894, p. 620). As the paper which he criticises so emphatically originated in this Society, it would seem eminently proper for me to produce my reply here. I was extremely gratified when I found that Dr. Trueman had considered my article worthy of his notice. Criticisms from such an eminent professional brother are both to be respected and desired. Criticisms upon any subject will always give to it life and vigor, and it is by these interchanges of opinions that we prosper.

The subject of Dr. Trueman's paper compels me to believe that he intentionally or otherwise misconstrues the meaning of my article. Throughout his essay he strongly endeavors to have his hearers believe that I would have vulcanite rubber banished from the dental laboratory. This was not my meaning, and I expressed my ideas clearly and concisely when I said that it was not the use so much as the abuse of rubber that is working the damage. I can plainly see how the first paragraph of my paper might suggest to Dr. Trueman the question which he has used as a title to his article. The question which he has both asked and answered—"Is prosthetic dentistry lagging? No"—was prompted by my assertion that while there had been great advances in all operations upon the natural teeth, there had not been a corresponding progress in prosthetic dentistry. The gentleman wanders far from his text, treating the whole subject as though I had said that prosthetic dentistry is retrograding. I am free to admit the wonderful advances in both branches of our calling, but am firmly impressed with the idea that plastics (blessings though they be to thousands) have forced dental prosthesis to the rear.

Dr. Trueman does not believe that vulcanite rubber is the father of the dental charlatan, and brands my suggestions upon this point as "absurd," "saddening," "humiliating," etc.

He attempts to strengthen his assertions by the statement that "writers of a century and a half ago speak as glibly of dental

quacks" as do writers of the present day. How could it be possible for a profession to be invaded by pretenders or quacks when such a profession did not at that time exist. I quote from one of the very best authorities when I tell you that dentistry has only taken rank as a distinct profession within the last century. "From advertisements in the newspapers of 1803, the practice of making and cleaning teeth appears to have been in the hands of jewellers and silversmiths." With the "business" in so primitive a condition at the beginning of the present century, we can only refer to all those giving attention to it at that time as pretenders. The doctor would have all "who rose as exponents of dental thought" uncover the pages of history to find "the evidence through which scientific conclusions should be sought." My paper made no pretentions to science; it was intended to be a simple, plain, every-day, common-sense composition, written for the purpose of expressing the thoughts of the writer, without the slightest desire or intention to elaborate or deceive, by the introduction of spread-eagle paragraphs, frequently as deep and as bottomless as the ocean, as dry as the desert, lines calculated to bring slumber to the most chronic case of insomnia. My friend speaks of the long and tedious days spent upon the finishing of a gold or silver denture, of the skill required and time expended in refining and preparing the metals; of the bending of plates into shape, and quite likely their horrible mutilation by that fiendish tool the horn mallet. We are living in an age of advancement. To-day gold plate is as readily obtained as vulcanite rubber, horn mallets will soon be a thing of the past, and when a metal plate is brought into shape by the modern method, there is no necessity of the weary days of "rubbing, rubbing, rubbing."

With all these changes, so much greater the shame that gold plates are not more frequently recommended. What Dr. Trueman condemns in one paragraph he admits in the next; his admissions amounting to little less than a complete acceptance of my ideas, which, as he says, were written without thought, while from his pen flowed the more thoughtful thoughts of a "better informed and thoughtful man."

In conclusion, Mr. President, I must thank Dr. Trueman for his one word of praise.

My paper, while possessing no good qualities, emanating from the "expressions learned parrot-like," which are among the "stock fads" constantly used in our dental meetings, and very much like the "stuff" in all recent reports of society meetings; this paper,

with ideas so "absurd" and amusing, both "saddening" and "humiliating" to him, receives the compliment of being fully up to the times, and on an equal with the general literature of to-day. Whither are we drifting?

Such expressions as the foregoing quotations, while probably interesting and entertaining to the writer, can hardly be considered within the code of ethics and show upon their face a lack of good judgment. After all, which should be condemned, the writing or the publication of this class of criticism?

Adjourned.

THE regular meeting of the Odontological Society of Pennsylvania was held February 9, 1895, President C. N. Peirce in the chair. Upon the conclusion of routine business, the President called upon the essayist of the evening, Dr. R. M. Sanger, to read his paper on "Salol."

SALOL.

BY R. M. SANGER, D.D.S., ORANGE, N. J.

MR. PRESIDENT AND GENTLEMEN,—If originality of thought or newness in treatment are prerequisites in writing a paper that shall be profitable, there can be no excuse for this paper. But if observation and experience have any value, I can reasonably expect to make the subject chosen one of interest to you.

In the *Dental Cosmos* for May, 1894, there appeared an able article by Dr. A. E. Mascott, of Paris, France, on "Salol in Root-Filling," which impressed me to such a degree that I at once began experimenting with this material. The result was most gratifying, and salol has become a valuable addition to my list of remedies.

Dr. Mascott describes the drug and its action as follows: "Salol is a compound in which one hydrogen atom of the salicylic acid has been replaced by the radical phenyl. To obtain it the perchloride of phosphorus or the oxychloride of carbon, or nascent chlorydic acid, is made to act on a mixture of salicylate and phenate of sodium. It is also obtained by another method. At 120° C. the oxychloride of phosphorus is made to act on a mixture of salicylic acid and phenol, producing the salicylate of phenyl, or salol. Thus obtained, it is in the form of a white, crystalline powder, insoluble in water and glycerin, but readily soluble in ether, alcohol, chloroform, benzine, spirit of turpentine, copal balsam, liquid vaseline, fixed and volatile oils. It has a fragrant taste, and smells similar to the essence of winter-green. At 40° C. it completely fuses into a liquid. When the temperature is raised to or near its boiling-point, it retains the liquid state after the temperature has again fallen below its melting-point. Even at the ordinary temperature of the office-rooms it will remain fluid from fifteen to twenty minutes; but if fused at the lowest possible heat it then returns in a few minutes to the solid state. This substance has also the peculiar property of forming intimate mixtures with iodoform, aristol, and camphor. Melted together, salol and aristol, salol and iodoform, become liquid like salol alone, which form in a

few minutes a solid mass, not a new chemical product, but a mixture of two substances, having each one of them all of its characteristic properties, excepting the new form of crystallization. Salol was proposed by Professor Nencki as a substitute for salicylate of sodium. Its general use is that of an antiseptic."

As a root-filler, salol is manipulated in this manner: Having the rubber dam adjusted, the cavity dry, and the canals sterilized by any of the various methods at our command, the root is thoroughly dried with an Evans root-drier, and the salol crystal placed in the cavity with a flat spatula or an amalgam carrier. The hot root-drier is then passed through the powder, which immediately melts and follows the instrument into the canal, following by capillary attraction beyond the point where the instrument stops. Repeating this once or twice, the canal will be entirely filled with the liquid salol. A warm tin or copper canal-point is then introduced, and carried carefully as far into the canal as possible without passing through the apex. It is then left for a few moments to cool, when the canal-point will be found to be solidly embedded in a crystalline, antiseptic mass which entirely fills the canal. If the cavity is so situated that the crystals cannot be readily placed in position, the salol is first melted in a test-tube, care being taken not to heat it more than just enough to liquefy the powder. Then by the use of a glass syringe, slightly warmed, the salol is placed in the cavity, and carried to the end of the canal by the use of the root-drier as before.

I have yet to record a single failure from this use of this material, and I believe it to be as near the ideal root-filling as anything yet offered to the profession.

If from any cause we should desire to remove the filling, a warm instrument held against the metal point will quickly heat it through, causing the salol to melt, and the whole can be readily washed out of the cavity with alcohol without any undue pressure or irritation to the sore tooth.

Just a word here regarding these little glass syringes. They are made of blown glass, and may be heated over an alcohol or Bunsen flame, and the point bent to any desired shape without fear of breaking if care be used when the heat is first applied. They are very cheap, costing about one dollar per dozen, and will be found extremely useful where a syringe is needed.

We frequently have cases presented where the teeth have decayed to such an extent that to remove all the infected tissue would expose the pulp, and to leave it would almost certainly insure ex-

posure and trouble from recurrent decay unless thorough sterilization can be secured and maintained. Let us suppose the case of an inferior first permanent molar. Having adjusted the dam, dried the cavity, and removed as much of the infected material as the condition will admit, sterilizing the remainder as thoroughly as possible, by the use of whatever non-irritating germicide the operator may prefer, the cavity is then thoroughly dried, and the crystals of salol placed in with a flat spatula, and melted by passing over it a smooth, flat burnisher or amalgam plugger warmed sufficiently to liquefy the salol without causing pain to the patient. The less heat used the more quickly crystallization takes place again, which should occur in three or four minutes at the longest. We have now sealed the floor of the cavity with a firm mass of antiseptic material capable of receiving considerable pressure without inconvenience to the patient. This is far from being a non-conductor, however, and should be covered with a layer of cement before the final filling is inserted.

In treating an upper tooth under similar circumstances the only difference would be in the manner of introducing the salol. Here we take a piece of asbestos felt, cut to fit the floor of the cavity, warm it over a spirit lamp, and place it against the salol crystals, which have been placed on a glass slab for that purpose. Immediately the salol is melted and taken up by the asbestos, until it is more than saturated. It is then placed in the cavity, and, upon cooling, we proceed as before, not forgetting the cement, however, as the asbestos thus treated does not give a non-conducting surface.

Where the pulp is actually exposed, and we desire to cap it, remove as much decay as possible around the edge of the exposure, and saturate the floor of the cavity with oil of cloves or cinnamon to relieve the pain, if any be present, and sterilize the cavity. A small disk of platinum, about 32 gauge, is then cut to fit the floor of the cavity, and the centre depressed with a ball burnisher, thus forming a metal cup. A paste is made of carbolic acid, oxide of zinc, and vaseline, with which the cup is filled, and placed gently over the exposed pulp. The crystals of salol are then placed over the cap and liquefied by passing over them a warm, flat burnisher. In a few moments the cap and floor of the cavity are hermetically sealed, and the tooth is ready for filling.

Salol is readily dissolved by any of the volatile oils or alcohol. All surplus should be carefully removed from around the edges of the cavity and the outside of the tooth, as it is irritating to the mucous membrane, and will make an abrasion somewhat resembling

a canker if left in contact with the gum. This sore is not dangerous, however, and will heal in a day or two, the healing being hastened by the application of vaseline.

DISCUSSION.

Dr. Crouse.—I am not at all familiar with the material here recommended, and should not care to give an opinion without some investigation. I have had one material for root-filling that has satisfied me for twenty years. I am not casting around for new root-filling materials. I have but one way of filling a root of a tooth, and I do that with oxychloride of zinc, carrying it to the point of the root, with one or two laps of No. 10 gold on a very small broach, wrapped on in such a way that when the broach comes away the gold will stay there. I have practised that out of the mouth and in the mouth, and I do not know of a single failure. Still, I am very glad that some of the younger men, who have more time than I, are looking up the newer things.

Dr. Faught.—I have not used this method. Like Dr. Crouse, for the twenty years I have been practising I have never departed from one way. I fill all my canals with cotton. But I can readily understand how I might be induced to follow the modified plan of my worthy friend and use salol as directed.

Of course, those who use oxychloride of zinc never expect to take it away, never have failures, and never remove it; but I have seen a great many oxychloride fillings under most distressing conditions. I do not care to close a canal with anything that cannot be removed, and it seems this material can be removed at almost any time.

Dr. Deane.—Under encouragement of Dr. Kirk I took up the use of salol for the filling of root-canals. The method by which I apply the salol differs somewhat from that pursued by the essayist. After applying the dam, I cleanse the root thoroughly by the application of sodium peroxide in powder, working it down into the canals by the use of a fine broach from which the barbs have been removed; then, applying one or two drops of water, I allow it to remain until all effervescing has ceased. A piece of sponge is laid by the side of the cavity to absorb the water. I wash out all the solution of peroxide and apply hot air; when thoroughly dry, a fine broach is warmed and carried as far up the canal as possible. Then the salol is taken between the beaks of a pair of long, flat foil-pliers and passed over the alcohol flame, when it immediately melts. I then place the points of the foil-pliers, containing the

melted salol, on either side of the warm broach in the root-canal, and gently open the forceps. The salol will immediately run up the broach and fill the canal. Gently withdraw the broach, and if any air is at the apex of the root it will be seen to follow the broach down and appear in a bubble on the surface of the salol. Apply cold air and fill at once.

An experience has led to some thought. Recently I filled a lower six-year molar. I felt sure both roots were entered. It was a case I could watch carefully. It was opened the other day, and in one of the roots not a particle of salol was found; and yet it had been carefully sealed. Dr. McQuillan has had the same experience.

Dr. Sanger.—Was the root putrescent before it was filled?

Dr. Deane.—Yes; and there was an abscess, I believe. The apex of the root was open sufficiently to allow the salol to pass through. The abscess healed very nicely, but I want to know what became of the salol.

I wish to call the attention of the Society to the use of sodium peroxide for cleansing putrescent canals. Take a spatula and force some of it into the root with a broach, and moisten with a little water. It will boil up and fume a few minutes; then wash it out and dry the root with heat. I have so treated several roots that had bad putrescent pulps, and filled them immediately. Up to this time I have had perfect satisfaction with the treatment.

Dr. Broomall.—Has salol any therapeutic action upon a diseased root, or does it act only as a sealing structure?

Dr. Sanger.—As stated in the paper, the action of salol is that of an antiseptic. I have thought the action of the crystal might be analogous to that of carbolic acid; whether it is so has not been determined.

Dr. Broomall.—That is what I wished to know. When we fill roots with cotton we usually soak it in some remedial agent. I was wondering if this article had any such qualities that would render it superior to carbolic acid.

Dr. Curry.—I have used salol in six cases, and in four of the six there was decided pain. Has the essayist found it to contract or crystallize?

Dr. Sanger.—I have no knowledge of its contraction. I have tried it in roots out of the mouth and in glass tubes, and have never had any trouble such as the doctor describes. I am at a loss to understand the cause of pain, unless the salol passed through the apical foramen.

Dr. Brubaker.—I believe it is the general impression that salol, when it comes in contact with the alkaline basis in the small intestines, is converted into carbolic acid or salicylic acid, and all the virtues of salol are largely attributed to these agents.

If salol is introduced into the tooth and it passes through the apical foramen, there is a possibility that the alkaline plasma which is around the foramen of the tooth would decompose the salol into carbolic acid and salicylic acid. Therefore in the root-canals salol would simply act like carbolic acid.

Dr. Warren.—I have never used it clinically, but have had experimented with it out of the mouth. With lower molars or bicuspids, where gravity would act, the roots, on being opened, were found to be filled perfectly to the end; but where the tooth was held in such a position as they would occupy in the upper jaw, the roots were not filled. When a warm instrument was introduced, gravity would draw the material back.

No one else responding, the President called upon Dr. Sanger to close the discussion.

Dr. Sanger.—I purposely avoided the question of root-treatment. We presupposed that the root was ready to fill. A perfect root-filling has not been found. One of the most scientific papers, to my mind, on the subject of root-filling, was read by a gentleman in the South, where he described a method of filling roots with paraffine, by the use of an electrode and metallic points. It pleased me because our object in filling a root is, if possible, to seal it hermetically, so that it shall not in the future become contaminated from within or without. You understand clearly the position taken by some in regard to porosity of the root. Remedies in the canal may pass out through the canaliculi, and, reasoning by analogy, if they can pass out, why can't they pass in? We do not discuss that subject, but if we can seal the canal perfectly, seal it hermetically, we are a step nearer to the desired point.

One of the beauties of this remedy, to my mind, is its easy removal. A good general always keeps his base of supply open, likewise his road of retreat, and so I think it is scientific for us to always leave a means of retreat; the more easily we can do that for the patient, the more scientific our treatment is, although such precaution is a tacit acknowledgment that we are sometimes obliged to make a retreat.

The value of salol is not alone as a root-filler; if it had been, I should have confined my paper to that subject; but, for the uses I have described, I think it is well worthy of experiment.

Dr. Bonwill.—Ever since the implantation of the roots of teeth I have been interested in that method, and have been experimenting in a parallel line. What I shall speak of is the feasibility of implanting metallic tubes into the alveolar process from three-eighths to half an inch in depth. The object of the appliance is to take the place of bridge-work.

He then exhibited a model that consisted of a tube into which was inserted a pin that could support a crown; the pin moved easily in and out of the tube.

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A REGULAR meeting of the Society was held March 9, 1895, President Peirce in the chair.

Owing to the late arrival of the essayists, the president called on the members present for incidents of practice. In response Dr. Jeffries said,—

I would like to speak of a gentleman who had suffered for about eighteen months with neuralgia. He had been to his dentist a number of times and had his teeth examined to find out, if possible, the cause. In this emergency the upper wisdom-tooth on the painful side had been taken out. That was the history when he came to me to see if I might give him relief. There were no cavities or dead teeth on the affected side, but a broken root of the extracted wisdom-tooth remained, which I removed.

In sounding the bottom of the old socket I detected the crown of a tooth opposite the posterior buccal root of the second molar. I endeavored for half an hour to extract it without losing the second molar. Finding this impossible, I took out the second molar, and then without difficulty extracted a second wisdom-tooth that was lying on its side with the crown surface pressing against the roots of the second molar. The gentleman was cured of his neuralgia.

Dr. Peirce, the president, then related the following: A somewhat analogous case was that of a lady of about forty years of age, who had been wearing an artificial denture for eight years. A tumor appeared, which grew to some size, and the patient suffered considerable neuralgic pain. I made an incision in the tumor, and took out three teeth impacted together. One was nearly normal size, the second much smaller, and the third was very small. Relief was afforded after these were taken out.

They were located on the right side of the upper jaw, and a hole had been cut in the plate so as to give room to the tumor.

The larger one, which alone could be classified, appeared to be a third molar; the other two were much smaller and could not be designated as any particular tooth. The operation gave entire relief.

Dr. B. Holly Smith read a paper entitled "A Plea for Moderation."

A PLEA FOR MODERATION.

BY DR. B. HOLLY SMITH, BALTIMORE, MD.

It is becoming a matter for serious consideration and thought how far the work of preliminary training shall extend, and what portion of a man's life shall be given to preparation pure and simple.

Among educators this question has been most thoughtfully and ably discussed, and there are not lacking adherents of the practical side of it who would limit the time spent in getting ready for the work of life. Theoretically, preparation should be perfect, and, theoretically, no time is misspent which is devoted to thorough, elaborate, and consistent training.

We have been educated up to the point of expecting higher things, and the cry all along the line has been "elevate the standard and raise the dignity of the profession." This has been true, nay, is true, not only in professional branches of education, but in all departments of preliminary work.

Secondary schools all over the country are presenting curricula whose faithful performance calls for the extended and elaborate work of a university. Colleges think it beneath their dignity to confine their efforts to the former contracted limits, and within the trackless maze of the university proper all is lost sight of to the ordinary mortal beneath the cabalistic and mysterious terms of individual "investigation and original work."

The laboratory, the library, the lecture-room, the pen, the printing-press feed and fan the flame, and promote the activity of these swarming original workers. Many are the manuscripts; monographs are multiplied; bloated volumes, immature digests, and accumulations of valueless trifles, the results of frantic strife for doctors' degrees, load the overcrowded shelves of groaning libraries, until we remember with some satisfaction that "of making many books there is no end, and much study is a weariness to the flesh," and would be glad "to hear the conclusion of the whole matter." The fact is, the world has begun to differentiate, nay, has progressed so far along in the way of differentiation that it is extremely difficult to say where the thing will cease. Specializing is the fascinating pursuit which claims the best efforts and attention of our ardent young workers, and getting ready to specialize is the subject that engrosses the stern, restrictive, disciplinary watchfulness of our vigilant leaders and thinkers. What is necessary? What

degree of training? What amount of time? How much study? If the limit for these requirements is too greatly contracted, an injury is done the profession and the public. Our conservators, our jealous guardians of professional interests are ever on the alert to guard against this, and elevation of the standard of professional dental education has been the constant aim and care of every devoted lover of dentistry. Thanks to the noble and united efforts of devoted men this end has been most successfully attained. All honor to their efforts. All praise for their success. But are we prepared to go to extremes in this matter? Is there not a golden mean, whose practical and certain attainment is of more real value than a theoretical elevation of standard which will discourage and prohibit or else beget dangerous practices of evasion and circumvention? To most questions there is what may be called the utilitarian side, and it is certainly true of this particular one.

What is practicable, what is attainable, is better than the ideal and visionary. The former can inspire hope and promise of success, the latter fills us with the gloom of discouragement or renders us guilty of the duplicity of self-deceit.

The course of preparatory dental study has been lengthened to three years, and preliminary examinations are required in accordance with the recommendations and suggestions of the Association of Faculties. This great improvement is meeting with unquestioned approval everywhere, and the benefits conferred upon the profession are not to be doubted for one moment.

Why not go further? say some of our enthusiasts. Why not extend the course to four years, and increase the requirements of the preliminary examination? Can we have too much of a good thing?

Undoubtedly the matter under discussion is simply a question of degree, and it becomes our duty as fair-minded, temperate, impartial men to decide whether we are prepared to side with the extremists on this question.

Is it not the more reasonable plan? Is it not the better and more advisable policy to adjust ourselves to the acknowledged excellent conditions now existing before we create those of a more difficult and exacting nature? Let us make haste slowly in this matter. If we do well in practising the task we have set for ourselves in theory, I think we may well rejoice in the attainment of a great and visible good,—something not to be exchanged for the imperfect realization of more vigorous requirements.

We all know that as far as successful and creditable performance

of the real work of our profession goes, we have made ample provision for preparation both in point of time and of requirements.

The practical and successful members of our profession would probably gaze askance at a summons to produce a good knowledge of the classics as an evidence of the capacity to treat diseased teeth. How would the majority of us feel if called upon before giving a clinic to construe ten lines from Virgil, or to scan an ode of Horace. And yet these tests are proposed. A knowledge of the classics is a most desirable thing, so of mathematics,—refining, elevating, cultivating,—but had we not better leave such matters to schools whose special function it is to teach them; and are we prepared to say to a candidate for admission into the profession of dentistry, "You don't know Latin; then you are not fit to study dentistry."

It seems to me we must limit preliminary requirements both as to subjects and amount; plainly to such subjects alone as are needed for the practical work in lecture-room and office. We have nothing to do with those ornaments and embellishments which are the flowers of culture. We do not dispute that the moral effect would be greater if every dentist were also a savant, —but would the real pain-alleviating power of the profession be increased?

As dentists, I take it, the degree of a man's ornamental culture does not concern us, but the quality and quantity of his necessary scientific and professional knowledge, and that only so far as it is a protection and a guarantee to the profession against ignorance and quackery.

We may resolve that it is a most creditable thing to know Latin, but can we legislate that one cannot be a dentist unless he does know Latin?

Now as to lengthening the time of study in dental colleges. I simply think we are not at present prepared to do it.

Reasons.—1. The dental profession through its institutions of education is already fully abreast of the other professions in its requirements.

2. There is no necessity of overlooking the educational influence of the dental society and the dental journal, nor of expecting that every student who emerges from a dental school should have a finished education; he is only to be equipped with the knowledge which will enable him to grapple with the problem of his professional life; and there will still be much that can be acquired in no other way than by contact with his brethren of the dental profes-

sion and in the actual handling of a practice. If we carefully fit good men to profit by these larger opportunites, have we not fulfilled our mission as teachers?

3. We have no right to refuse to recognize the opportunity to establish post-graduate schools, whose influence would benefit in broadening and deepening the culture of the few who could afford these privileges. All schools and all students should not be required to go so far; it would work an injustice and cause the arrest of many a career.

4. We cannot afford to limit the number of those entering our profession to such as are sufficiently well off in this world's goods to give so extended a time to preliminary training; they are too few.

5. Experience teaches that a man too long kept in leading-strings—that is, under the guidance and direction of teachers beyond the period of greatest enthusiasm and activity—is forever handicapped.

The difference in the two methods may be readily seen by a comparison between the practical efficiency of our own dentists and those of Germany, where preliminary training is carried to its ultimate conclusion.

But beyond and above all am I unalterably opposed to any measures designed to prohibit young and reputable men from entering upon the study of this profession simply as a protection to ourselves.

Such a course would be a crying injustice to them and of suicidal folly to us. The theorists who advocate it have not considered.

Do we deem our profession worthy, let us invite talent to its ranks and stimulate the deserving to join us. No selfish policy can protect us,—and from such protection we should all pray for deliverance.

What do we fear? What do we hope? Our brief span must soon run out, and to whose care must we confide the glorious enterprise of our lives except to the noble youth who glows with the enthusiasm of a generous and honorable emulation.

DISCUSSION.

Dr. Henry Leffmann.—I am not prepared to differ very seriously with the paper, but I am not entirely in accordance with some of its statements; I mean as to the value of a college education, what we may call, for want of a better term, classical training. The value of this training in its bearing upon professional work is a

very difficult thing to determine, and we have very incomplete data upon which to form a judgment.

It is undoubtedly true that genius asserts itself in a variety of ways, and that very able men have passed into the profession without much preliminary training, but I think we must look at preliminary training in its selective effect. Some years ago Dr. Pepper, in a paper on medical education, made a very wise remark. He said that a preliminary examination might be of value in deterring unworthy students from entering the college, as the mere mention of requirements might be sufficient to keep out certain incompetent persons. Appearing before the community as a profession, it is important that the merely practical phase ought not to be given too large a place. Dentists want to be more than simple repairers of teeth and manufacturers of artificial dentures; they want to carry a degree which is a degree of honor; they want to take rank as educated men, and so the colleges ought to insist upon some preliminary requirement other than those merely of the lowest school grade. Of course, the colleges do not pretend to take men who are not familiar with reading, writing, arithmetic, and some fair knowledge of the phenomena of life; but I recollect in my early days, when I was acting as quiz master, having a gentleman in my class who did not know the nature of a decimal fraction.

It seems to me that we might at least insist on some kind of a high-school education so that our students might be capable of understanding the more difficult departments of science which are laid before them. There is in the minds of many persons the thought that dentistry may be before long a specialty of medicine, and that a medical degree will be required as part of the dental degree. If so, we shall certainly have to prepare the profession for that expansion.

There is one thought that struck me, which is in reference to the question of the poverty of students. I think our charity at times is a little too wide in educational matters. When it comes to providing men with means for making their living, I question whether the State and college is not going too far in encouraging those who are simply unable to pay their way. It may be true, in rare cases, that some valuable minds may be lost to the profession, but in such cases I think the qualities will be such as to attract private assistance. A part of a good education is the money it costs, and my experience, which extends over twenty or twenty-five years of work in several collegiate institutions, leads me to

believe that the assistance which is given in colleges to fit the student for professional life is often badly placed. Very often it brings into a profession some one who is better fitted for a humbler calling.

As to the extension of the dental course to four years, I myself am not in favor of it, but I think that what we want to do is to raise the preliminary requirements very decidedly; have some system by which we may gather together in the lecture-room a class of students who are thoroughly capable of appreciating the work that goes on before them. It is a very easy thing to say that a man may be a good dentist and yet not able to read Latin, but at the same time, in the course of his study of Latin and other collegiate branches, his mind becomes developed so that he makes a better dentist. I once said to a chemistry class, in explaining a difficult problem, that probably some great medical man (I gave his name) did not understand the subject upon which I was lecturing and was no worse practitioner for it, but that at the period of his student life at which he would have been expected to know the abstruse point he would have known it. While in after years a person may not be able to construe a sentence of Latin, yet in his work as a practitioner he will be better developed and better able to do the work of the profession if he has construed such sentences in his student days.

Dr. Bonwill.—If I had been obliged to understand Latin and Greek I would never have been a dentist to-day, although it is a splendid thing to know them in order to understand the derivation of words if for nothing else, but a man must have mechanical genius.

There should be no extension in the period of tuition; with a man of genius it becomes unbearable. Only by getting into actual work and coming in contact with older practitioners will he be fully equipped to do his work. Further, there should be no such thing as a post-graduate course, as the colleges are supposed to have the best teachers procurable, and in setting up a post-graduate course it is a reflection on the present institutions of learning.

Dr. Smith.—I thank the gentlemen for the courteous treatment of the paper. I was well aware before the paper was presented that it would meet with opposition. I know that the gentleman who discussed the paper at some length has the popular side of the question, and I do not desire to take any further issue with him than is taken in the paper. My claim and my position was that we may rest upon our oars and that we do not force in any im-

moderate way the good movement already started. I do not think any gentleman in the room will charge me with desiring too low a standard in the dental profession. On the contrary, all I have ever said or done has been in the line of progress. But there are many incongruous and inharmonious plans and suggestions offered as to the education of dental students, and it is with the view that some harmonious conclusion may be gotten from them that this paper is presented to you.

Dr. William Shaw Twilley, of Baltimore, Md., next read a paper entitled, "The Census of 1890 and the Dentists."

THE CENSUS OF 1890 AND THE DENTISTS.

BY DR. WILLIAM SHAW TWILLEY, BALTIMORE, MD.

In August, 1890, I was approached by Doctor Richard Grady who, in a joking way, asked if I considered myself "a manufacturer," to which I replied, "No." He then gave me the first information I had received of the intention of the Census Bureau to classify dentists as manufacturers, telling me that one of the enumerators had requested and then demanded of him to reply to the questions of the manufacturer's blank. I assured him I would object to answering, and would only do so when forced, and then under protest. That week, it being the last week in August, 1890, an enumerator called at my office, and when he pressed the matter I filled in the blank of name, age, occupation, and address, refusing to answer any further questions, which determination was met with a threat of prosecution in the Federal courts. I related my experience to Dr. Grady, who assured me if the profession of the city would support him he would persist in his refusal.

On the afternoon and night of September 30, 1890, I made every effort within my power to gain that support, but failed to succeed. I being the second on the list, Dr. Grady (who had in the mean time made use of the public press to call the attention of the profession to the need of early and earnest action) very kindly assured me of his support should the organizations stand by me, which in a way was done, and I am glad to say he more than fulfilled his promise, as it was by his advice and the use of the public press that the early work was put in shape and condition. Soon the Maryland organizations, with Professor R. B. Winder now as commander-in-chief, were quite actively engaged in the matter. The first official call ever issued by any organization was by the

Association of Dental Surgeons of Baltimore City, September 11, 1890, calling a meeting for Friday evening, September 12, 1890.

It was there decided that, inasmuch as the Association was small in numbers, and each member thereof also a member of the Maryland State Dental Association, they would as a body resist the demands, but let the financial support come from the Maryland State Dental Association, which organization issued two calls in the month of November, 1890. At one of these meetings a resolution was adopted "that all members refuse to sign the report offered by the census enumerators, and that the sum of two hundred dollars be appropriated to defray the expenses of the dentist of whom a test case be made."

On January 14, 1891, the public press announced that a committee from one of the city organizations had visited Washington, and, after consultation with special agent Williams, had signed a paper advising the dentists of Baltimore no longer to hesitate in giving the information required. Upon their return and after legal consultation, finding that no penalty was attached for non-compliance, the public press on February 4, 1891, informed us that the same committee "repudiate their action of January 14, 1891, and withdrew their signature to the agreement." I hope soon to give the stenographer's report of this meeting.

After a seeming rest of a year, what was known as the "Willcox Bill," and styled by the press as "a bill in the nature of thumbscrews and spiked boots," passed the House of Representatives. Again the war-cry was sounded, and the Maryland State Dental Association reaffirmed its action of November 20, 1890, and appointed as a committee Drs. R. B. Winder, Sr., Edward Nelson, T. S. Waters, A. J. Volck, William A. Mills, David Genese, and W. S. Twilley, instructing them to use every honorable means possible to prevent the passage of this bill without an amendment so as to omit dentistry in all its branches from the tabulations of the census. The first official act of this committee, Professor R. B. Winder, chairman, was to urge other State dental organizations to co-operate with them for the end desired. As a result, committees from societies of New York, New Jersey, Pennsylvania, Connecticut, North Carolina, District of Columbia, and Maryland formed the "Associated Committee of the Dental Societies," Dr. John B. Rich, chairman. Many copies of the Willcox Bill were printed, and with the desired amendment attached were sent where it was thought good could be done.

I have since been told by the chief of one of the departments of

the interior that they were for a time overrun with protesting letters and marked copies of this bill. From the calm following this work it was thought peace had come, but no; imagine the surprise of your humble servant one evening when, glancing over an afternoon paper, he read that the "Willcox Bill was on file in the Senate for its final reading." Hastening with the news to the ever-willing Professor Winder, he at once, with all that energy which characterized him, worked with untiring efforts for the suppression of this our common foe. The Associated Committee again commenced work, and urged each society and member thereof to bring to bear upon the individual members of the Senate all available influence. To Dr. Rich belongs, so far as I know, the credit of securing a hearing for the dentists, a task by no means to be despised or belittled. At the hearing Dr. Rich, as our spokesman, made such an oratorical and scientific effort, lauding the dentists so highly, that those manufacturers present, with the chairman, Hon. Eugene Hale, of Maine, as their leader, became somewhat aroused, and for a time it seemed as if ours was a lost cause.

Professor Winder, who had worked for two days and nights in Washington with but little sleep, appeared exhausted and unable to raise his voice in a single effort to stém the tide which was now about to carry our little craft upon the rock of destruction. "Opportunity brought forth the man," in the person of Dr. J. D. Thomas, of Philadelphia, who with great diplomacy changed the dark clouds of despair into bright rays of hope. There was yet a chance for the sinking ship, and with hope still within our hearts we sought to regain our position and succeed.

I arose, asked for five minutes of the committee's time. With a manufacturer's blank in my hand I read the questions asked and repeated the answers given. The whole thing seemed so ludicrous that Mr. Hale exclaimed, "I do not wonder you gentlemen object, if those were the questions asked."

Mr. Porter (who had travelled for two days and nights to be present at this meeting, as he afterwards remarked) replied that with the great number of men he had to employ it was impossible to avoid getting an ignorant one occasionally, and had he known of this enumerator he would at once have been discharged. To which I answered, "You could not help but know, as we were given the ordinary manufacturer's blank in printed form and you had before you our letters of objection, and yet this enumerator was kept upon the force for over eighteen months, and may be there now for all I know."

We were asked what we wanted. It was so easy to tell the "old old story,"—"To be classified with the lawyers and physicians."

Mr. Porter, realizing for the time being that he was defeated, answered, cheerfully, "Why, certainly, gentlemen, I will attend to it." Dr. Rich displayed his acuteness by demanding a "written statement to that effect right here while we are all present." Mr. Porter, who had started to leave the room, returned to his seat and wrote the original, of which this is a copy:

"The Superintendent of the Census agrees with representatives of the Dental Associations, at a meeting of the Senate Committee on the Census, to carry out the spirit and purpose of the amendment presented by the said Associations at the meeting, and which appears in the paper marked "A" hereto attached.

(Signed) "ROBERT P. PORTER.

"JUNE 27, 1892."

Success was now assured, victory was stamped upon our banners. Then followed hand-shaking, congratulations, and dinner with Dr. Williams Donnelly, where Drs. J. D. Thomas, of Philadelphia; Charles A. Meeker and F. C. Barlow, of New Jersey; H. B. Noble, John B. Rich, and Williams Donnelly, of Washington; R. B. Winder, William A. Mills, and William Shaw Twilley, of Baltimore, enjoyed the "feast of reason and the flow of soul."

DISCUSSION.

Dr. Richard Grady.—As Dr. Twilley has said, one of the census enumerators waited on me in August, 1890, and on the 1st of September, 1890, I published in one of the Baltimore papers an article entitled "Are Dentists Manufacturers?" I took the ground that everything which the dentist makes in his practice is surgical; that a filling is surgical. This matter had been gone over many years ago in the census of 1880. The head of the census department at that time was General Walker, who is now and was then president of the School of Technology, Boston. He was also editor of the report of your International Exhibition of 1876, and chief of the bureau of awards. In this very book the work of dentists was classed as purely surgical, and it was so classed not by dentists but by surgeons.

I represented in 1890 that the dental surgeon cannot properly be subjected to annoyance and investigation in respect to his professional work any more than the surgeon in other specialties of

the medical art; that he stands in delicate and confidential relations to his patients; that the demand for reports from dental practitioners was novel and unjustifiable; that the superintendent of the census of 1880, after correspondence, determined to omit "dentistry in all its branches" from tabulation, and caused all schedules on file to be endorsed to that effect and returned to their respective makers.

The word *surgery* denotes handwork in connection with the art of healing, whether manual or instrumental. I stated that so early as 1876 the surgeons classified the following specimens as purely surgical: "Pivot teeth, dentures, complete and incomplete, with and without spiral springs, the various methods of retention by atmospheric pressure and by clasps, and a series of orthopædic apparatus for the correction of congenital malformations of the palate, loss by scrofula, and syphilitic necrosis."

The appliances made in the operating rooms and laboratories of dentists, which the census office of 1890 claims as "mechanical," are made only after examination of the patient, or casts of the parts for which the appliance is needed. In some cases, teeth or soft tissue require removal in addition. When the appliance is finished it is useless and of no value except to or for that particular patient. These appliances are thus surgical. They are the result of diagnosis, prognosis, and handwork.

No schedule was left with physicians and surgeons. Why, then, should dental practitioners be called upon to give information in regard to the personal treatment of their patients?

In reply to these questions the census office said, writing to its agent at Baltimore, September 18, 1890, "In reference to mechanical dentists, you are informed that the term is considered by this office to embrace all branches of the profession except the extraction of teeth, and should be so reported on General Schedule No. 3."

I took exception to that definition. Time went on, and the census office, in October, 1890, wrote to your Philadelphia County Dental Society giving another definition of *mechanical dentistry*,—namely, "That branch of the profession which includes the manufacture of artificial dentures, such as crowns, plates, and caps." The census office was also in error in claiming that at the census of 1880 opposition was uniformly withdrawn when proper explanations were made to the persons averse to giving the information required.

The facts are that the superintendent of the census of 1880, in

deference to a general protest, determined to omit from the tabulations dentistry in all its branches.

On December 30 the census office decided to order the census officials to demand answers to all inquiries, and to prosecute those who should refuse to comply. Mr. Williams, a special agent of the census office, said to a *Sun* representative that the same questions that the Baltimore dentists objected to were being put to the dentists in other cities, and willing replies were being received every day. Determined not to let such an official statement go unchallenged, I wrote, "The iteration and reiteration in Washington that the dentists of Baltimore alone resist the purpose of the census-office inquiry is untrue, as the Philadelphia County Dental Association has unanimously adopted resolutions instructing its members not to attempt the impossibility of making any returns, and has presented its protest at Washington."

Now, I would like to show you gentlemen how correct you were in taking that stand. I don't know whether you are familiar with the Extra Census Bulletin or not; I never saw it until last night. In this bulletin this acknowledgment is made: "A large number of reports were received from dentists which purported to represent only the mechanical work, but it is evident that in many cases operative dentistry had been included. This fact, combined with the strenuous objection on the part of the profession to give any information whatever of the character required by the census schedule, on the ground that the census law does not seek to secure the returns for professional services, caused the office to discontinue its efforts to obtain further reports for the mechanical branch of the profession. The statistics published are those which were secured prior to the objection referred to."

I grieve to say that just when this news of hope afforded unparalleled opportunity for success, the public press, January 14, 1891, announced from Washington that "Baltimore dentists answer willingly," and that Mr. Williams, special agent of the census office, "believes the entire difficulty is ended and that the dentists of Baltimore no longer hesitate about furnishing the desired information." This was partially true. Nothing could have been more startling than the sudden admission of a committee of some Baltimore dentists that it was for the good of all concerned that practitioners should furnish the information which the census office desired. A feeling of depression, if not of indifference, followed the division of sentiment in Baltimore.

I answered this publication as follows: "In reference to the

paper signed last week in Washington, the three dentists who signed the paper at the census office did not voice the sentiments of the incorporated bodies of the city and State, the Association of Dental Surgeons of Baltimore City, and the Maryland State Dental Association, which have unanimously adopted resolutions declining to make returns, which resolutions have never been rescinded, and that the president of the Philadelphia Dental Society has written under date of January 16, that 'the society has no intention of receding from the position taken.' In no case that I am aware of has any member of the Society filled out a blank of the manufacturers census since the passage of the resolution."

In three weeks after my communication the error was atoned for, since Lawyer Venable gave as his opinion "that there was no penalty for refusing to answer the questions, and the dentists might either ignore the whole matter or answer generally that they did not operate manufacturing establishments."

So matters rested until the Willcox Bill was introduced in March, 1892, when I wrote the following, which was unanimously adopted by the Maryland State Dental Association, May, 1892:

WHEREAS, a bill has been introduced in Congress, which provides that any person who shall neglect or refuse to give information to census officers shall be subject to a fine not exceeding ten thousand dollars, to which may be added imprisonment for a period not exceeding one year; and whereas, the public press reports that the bill referred to "will be used in the nature of thumbscrews and spiked boots to enforce replies," and further, that "dentists of Baltimore who by their refusal to answer certain questions will be the first victims of the inquisitorial machine if the bill is passed," therefore,

Resolved, that this Association reaffirms the resolutions unanimously passed November, 1890, protesting against the action of the census bureau in classifying dentists as manufacturers.

Resolved, further, that the chairmen of the several standing committees as now constituted, be appointed to convey the sentiments of this Association to the Senators and Representatives of Maryland in Congress, and urge them to have the Willcox Bill amended, so as to omit dentistry in all its branches from the tabulations of the census.

Dr. Thomas.—History wants to be correct in all its bearings, and the history of the efforts made by that committee is not correct as it stands to-day, so I am very glad that Dr. Twilley, of the committee appointed by the American Dental Association, is making an effort to establish facts upon the correct basis.

As it stands to-day, any one who reads the report would think that 1892 was the beginning of the effort to establish the standing of the dental profession, and that Dr. John B. Rich was the man

who did it; but as Dr. Twilley says, two years before, in 1890, the effort was made by the Baltimore men, Drs. Twilley and Grady, and others, seconded by Drs. Boice and Faught of this city. They did not succeed, however, in arousing sufficient interest in the dental profession, and the proper stand was not made. Later on committees were appointed by various societies over the country who should go to Washington and attempt to defeat the Willcox Bill. I happened to be the representative with Drs. Faught and Deane selected to represent this Society.

In my address before the Senate committee, I said that the dentist, as an individual, did not by any means consider himself better than a manufacturer, but that the law required more of a dentist than of a manufacturer. The dentist was compelled by law to be an educated man and to have a diploma from a reputable college, while a manufacturer need not be able to write his name. Therefore, in the eyes of the law, the dental profession was on a higher plane than the business of manufacturing. But that was not the point of our argument. The fact was that dentists really manufacture nothing. Everything that comes to their office is already manufactured,—teeth, plates, screws, etc.,—and they simply take them and apply them to each individual case, and the denture has no possible value except to the individual mouth for which it is made. That point carried the day. Senator Eugene Hale said, "You might as well call a physician or surgeon a manufacturer because he fits a splint to a broken limb."

Dr. Faught.—Dr. Thomas has referrred in his remarks to the fact that this history has never been correct, and it is very essential for the future of the profession that this history be intelligently written and accurately stated. We are all aware that the American Dental Association has appointed a committee to take steps to do this, and therefore it is essential now, before the meeting at Asbury Park next summer, that all the facts be brought out in the local societies.

One thing I want to say by way of correction to Dr. Thomas's statement, that the efforts made prior to 1892 had not carried the profession with it. That is not exactly the case. There were not two separate efforts, one beginning with my work in 1890 and extending up to 1892, and another taking inception in 1892 under the direction of Dr. Thomas. The work which was done by me, largely as an officer of the Philadelphia County Dental Society and partly as a member of the Odontological Society from 1890 to 1892, certainly was not a popular movement, but it required courage on the

part of the few, and owing to their steadfastness and aggressiveness the foundation was laid for the successful culmination under Dr. Thomas in 1892; but I deemed it unnecessary to go to Washington, as my ideas were already before the Census Bureau in writing, while Dr. Thomas, too, being there (for the first time), could command attention with new facts.

On October 20, 1890, I introduced the first set of resolutions opposing the census classification to the Philadelphia County Dental Society, and at that time it met with bitter opposition. I remember how Dr. Boice said we were going into a pretty big fight; that we would have a great deal of trouble and take a good deal of time and expense to successfully contest the matter through the courts, and we would probably be mistaken if we expected to have the support of the profession. I insisted, however, and Dr. Boice withdrew his opposition and voted for the resolutions. The resolutions were adopted, and then on November 1 I came to the Odontological Society and introduced similar resolutions under threats of the Census Bureau. Those resolutions were afterwards rescinded by this Society, in so far as they controlled the individual action of the members. I was absent at the time. At the next meeting I again insisted, and the resolutions were again put on the minutes. In the mean time the census agent told me the resolutions had been rescinded, and I told him to go look at the minutes and he would find they were still there on the statute book, and he so found them. Then it was I went to Baltimore May 2, 1891, and afterwards up to Albany. Then the movement had become popular throughout the country, and you appointed the Thomas committee, which brought to a satisfactory conclusion the effort which the few had so pluckily striven for so long.

I do not want it to go on record and be understood that all the work which led up to it for two years was for nothing, and that the result was obtained without this battle. There was bitter opposition for two years, and it was only by the persistent action of myself and the few others that the matter was kept agitated and the result finally obtained at Washington in 1892.

THE regular meeting of this Society was held September 14, 1895. At the close of routine business the paper of the evening was read by Dr. C. N. Peirce, entitled "What has been done by the Profession in France on Pyorrhœa Alveolaris?"

WHAT HAS BEEN DONE BY THE PROFESSION IN FRANCE ON PYORRHŒA ALVEOLARIS.

BY C. N. PEIRCE, D.D.S., PHILADELPHIA.

IT is now something over two years since considerable interest was manifested on the subject of pyorrhœa. Many papers have since been written, and much notice has been given the subject in the journals, but to-night I propose to present the views of a few of the early writers and some more recent ones of France, that these may be contrasted with what has been already published.

That pyorrhœa alveolaris is not a disease of recent origin or due to modern constitutional states alone is very evident from examinations of the skulls of ancient races. The alveolar process of crania, widely separated in time and locality, exhibited marked impairment in structure and hold a very close resemblance to that presented by more modern processes which were known to have been the seat of pyorrhœa during life. The earliest dental surgeon to record his observations was M. A. Fauchard, who, as early as 1746, fully recognized the disease in all its essential features, but failed to designate it by any specific name or term.

M. Jourdain, in 1778, described the disease as "a conjoint suppuration of the gums and alveoli." Regarding the inflammation and suppuration as expressions merely of a constitutional scorbutic state, he advised "the extraction of the teeth as affording the only possible means of cure."

M. Joirac, in 1823, called the attention of the surgical world to this form of inflammation, which, from its most characteristic symptom, the flow of pus, he gave the name of *pyorrhœa interalveolo-dentaire.* That he recognized this disease seems evident from the statement that the gums became swollen and spongy, the suppuration abundant, the teeth loose and painful, and finally fall from their sockets.

M. Marchal de Calvi, in 1860, spoke and wrote of the disease as a gingivitis, having for its results the expulsion of the teeth, —"gingivite expulsive" he termed it. He regarded the disease as

hereditary and caused by the deposition of tartar, also that it was incurable unless all the teeth were removed.

In 1867, Dr. E. Magitot published his paper, which was the most complete systematic description of the symptoms and pathology of the disease which had up to this time been found in print. He commences by stating "that under certain circumstances individuals experience a premature, progressive, and continued loosening of one or more teeth, accompanied with abundant suppuration of the alveoli, with inflammatory phenomena of the gums, fungus excrescences, abscesses, and other peculiar phenomena, without the teeth themselves presenting any apparent structural change, and that this affection, if left to itself, finally ends in the loss of these organs." Magitot is fully impressed, as a result of his studies, that the gum, being in all cases only attacked subsequently, is not the real seat of the lesion. The disease with which we are occupied, he says, "seems essentially characterized, from an anatomical point of view, by a slow and progressive destruction of the periosteal membrane,—a destruction of an inflammatory character, of chronic progress, proceeding from the neck to the end of the root, and leading, without fail, to the loss of the tooth. This special feature its mode of origin, and the precise seat of the lesion, seem to justify the name *alveolo-dental periostitis.* But notwithstanding its primary origin in the periosteum and its complications with the gum and bony alveolar wall itself, the study of the successive morbid phenomena does not allow us to admit, as various authors have claimed, *that these parts are originally the seat of the disease.*

We should only need for proof the isolated localization of the trouble in one or more teeth without necessarily being communicated to those adjoining, the situation of the anatomical lesion, the special sign of the lesion, and, lastly, of the fact of constant cure following the removal of the affected tooth. These reasons, he says, "should more than sufficiently prove that it is the tooth and not the gingival tissue or any other part which should be regarded as the seat of the disease." Dr. Magitot then gives a clear description of the disease's progress, which is not necessary to mention here, beyond his etiology, which he gives as follows:

Etiology.—"The causes of this affection are quite complex, and should often be looked for, not in a local condition of the mouth or gums, but in certain conditions of the general health.

"The disease ordinarily attacks either one of the teeth singly, or several of them; but in this latter case the teeth affected are not necessarily contiguous.

"The age at which this affection appears is generally neither adolescence nor advanced age. The usual period is from thirty to fifty years. It seems equally frequent in men and women, and in the latter it often appears among the complex phenomena of the menopause.

"Certain intestinal phenomena are observed either in coincidence or in etiological connection; habitual constipation is noticed in affected patients. A physician of the Paris hospitals, Dr. Vidal, has noticed that these same patients often show dyspeptic phenomena. Perhaps these were due to difficulties of mastication. In all cases we have had personal opportunity of verifying this assertion. Gouty and rheumatic persons often show it. Those attacked by anæmia as a result of long illness are in the same condition, but there are no general troubles which exercise a more serious influence in producing the disease than albuminuria, and especially diabetes. By the first we mean here, of course, not symptomatic albuminuria, but Bright's disease, properly so called.

"In glycosuria this phenomena is absolutely continuous, and even constitutes one of the earliest signs of the diseased condition. We find, in fact, in the description of most authors, that at the beginning of diabetes the teeth are observed to loosen and decay. This assertion, as regards caries, is not correct, but the first is perfectly so, and corresponds to the osteo-periostitis, which follows in its development the same progress and advance as the general disease to reach the terminating period of the latter in the loss of a considerable number or all of the teeth."

The treatment of pyorrhœa, as suggested by Dr. Aguilhon de Serran, is especially interesting. He speaks as follows:

"I shall limit myself to a short discussion of the nature of the lesions and the treatment by means of which I have succeeded in conquering them.

"Suggestions for treatment are naturally derived from anatomo-pathological study. In the first place you must relieve the fibrous mass of the liquids which separate it, then excite the vasomotor action and favor the formation of new vessels and fibrous tissues. Chromic acid fulfils these indications to a certain point: it hardens and retracts the fibrous tissue and acts on the membrane as a powerful revulsive, and has therefore, in the hands of Dr. Magitot, given very good results. But it only acts superficially, and is only of use at the beginning of the disease. Besides, it cannot destroy the purulent burrows, the principal cause of the continuance of the trouble.

"The other methods of treatment have fallen into disuse. In most cases it is necessary to extract the teeth, one after another; and, as they are generally free from all decay, patients only decide to have it done after suffering for years, or when the stomach becomes affected as a result of insufficient mastication.

"After many fruitless attempts I had recourse to a very simple mode of treatment, which answers at once the several indications of which I have spoken. It consists in traversing the bottom of the burrow by a seton of floss silk which is left in place. It causes no inflammatory trouble. From the first the patient experiences great comfort. The unstable teeth, projecting outward, are rapidly brought back by the contraction of the fibrous tissue. Their firmness is perceptibly increased from the first hour.

"I have treated eleven patients in this manner, and I have always obtained the cessation of all pain and the strengthening of the teeth, in proportion, of course, to the extent of the destruction of the socket.

"As regards suppuration, the results are less satisfactory. It was only entirely stopped in two patients,—those in whom the disease was furthest advanced.

"I was anxious to present to you a lady whose case is curious from several points of view. Unfortunately, she is prevented by rheumatism from being present. When she consulted me this lady had been suffering for ten years. She could only eat soaked bread. She has only three molars, but she has all her incisors and three canines. She was treated for a long time with chromic acid. She even applied it so often that the roots, almost entirely exposed, are dyed a deep green. A few setons were sufficient to cause the disappearance of both pain and suppuration. The teeth are firmer, but, owing to the great reduction in their means of attachment in consequence of the absorption of the sockets, they will continue loose.

"Another patient was cured under the same conditions. All the others happened to be in a much less advanced state of the disease.

"From the first, without exception, the pain ceased and the teeth have become firm, but the suppuration reappears from time to time, in some cases at very remote intervals. I think this fact may be attributed to two causes: first, that I did not leave the setons in place sufficiently long. Fearing some trouble, I thought it prudent to remove them from the fifth to the eighth day; but it seems to me there is no objection to keeping them in for several weeks. The second cause is the difficulty of the manual work. It

is impossible to pass needles through the walls of the alveolus, and consequently to reach the lowest limit of the burrow. For this there must be invented a special instrument which I have not yet been able to make satisfactorily.

"A general treatment should be prescribed according to the case. I have obtained good effects from chloride of magnesium, whose action on the smooth fibre is most decided, and which produces besides a laxative effect almost always necessary. I propose to try, with the same object, injections of ergotine."

This ends my quotation, but I would say in closing that I have been asked several times whether, after three years' experience, I have still the same confidence in constitutional treatment in connection with local treatment that I had in the beginning. I can say most emphatically that the success with which many patients have been rewarded has been most satisfactory. I am firmly convinced that in a very large proportion of cases of pyorrhœa, where they have not gone on to the extent of the teeth loosening all hold, by the sockets being completely destroyed, they are benefited by careful constitutional treatment, embracing proper diet and the application of proper remedies in connection with local treatment. So that every day I am applying these remedies, and the patients say they are compensated fully in doing so.

DISCUSSION.

Dr. Brubaker was called upon by the President, who responded as follows:

It will have been noticed in the abstract of Professor Magitot's paper, as read by Professor Peirce, that pyorrhœa alveolaris has been observed in the diabetic, the albuminuric, as well as in the arthrotic or gouty patients. The occurrence of pyorrhœa in diseases which are apparently so widely separated as these three would seem to militate against the view that the disease in question was simply a gouty manifestation. If, however, the gouty diathesis be received in its totality, it will be observed that very frequently both glycosuria and albuminuria are but two more of its various manifestations.

In many cases of incomplete gout the excretion of sugar by the kidneys alternates with deposits of uric acid, and as the production of sugar is supposed to be a function of the liver, the inference is that this disturbance of function is dependent upon uratic deposits in the liver. With the elimination of large quantities of water under such circumstances the uratic salts are excreted, after which

the gouty symptoms subside. If a patient with this temporary glycosuria had at the same time pyorrhœa, it might, at first glance, be supposed that the former was the cause of the latter, rather than that they were both symptoms of one systemic condition.

The same holds true with reference to the transient form of albuminuria. Traces of albumen are exceedingly common in the gouty condition, and are supposed to be due to the involvement of the kidney, and more particularly the excreting epithelium from the excess of uric acid. Here, again, the two conditions, albuminuria and pyorrhœa, do not necessarily stand in the relation of cause and effect, but as simultaneous expressions of a common diathesis.

Dr. Head.—The treatment by a silk seton, as suggested by De Serran, seems most valuable, and should be given a fair trial. The difficulty of healing the pockets is increased by the presence of pus at the bottom, and if the pus should be allowed to escape it is reasonable to suppose that the granulation would be much more effective and rapid.

Dr. Peirce.—I was in hopes that Dr. York would be here this evening. He has a very interesting case that has been under his care, which I have seen three or four times,—a lady whose teeth were very loose and the gums very much absorbed. Some four or five months ago, while consulting with him, I suggested to her that she use considerable friction with her finger on the gums every day, rubbing them freely around where the parts had been so much destroyed. At her last visit she assured me she had done this vigorously, and the change was remarkable. I have constantly taken the ground that we cannot produce tissue that has been once absorbed, but the gum tissue in that patient's mouth was normal, probably induced by the friction of her finger. Certainly the remedies applied would not have acted so, but the friction which she gave them undoubtedly brought about the development of a normal quantity of good, firm tissue.

A MEETING of the Odontological Society of Pennsylvania was held Saturday, November 9, 1895, at 1415 Walnut Street, Philadelphia.

The paper of the evening, "The Heroic in Dental Operation, as contrasted with Conservatism," was read by Dr. Kratzer.

THE HEROIC IN DENTAL OPERATION, AS CONTRASTED WITH CONSERVATISM.

BY C. V. KRATZER, D D.S., READING, PA.

THERE may be a diversity of opinion as to what constitutes the heroic in dentistry; there may even be some scepticism as to the propriety of applying the term at all to operations in our branch of the healing art. It is not proposed here either to set up a standard or discuss the question of propriety in the application of terms.

Strictly speaking, the combination of terms in my title constitutes a paradox, for the true hero is the one who conserves the interests of his fellow-man. The subject will be viewed here, however, in a broader sense, the terms representing diametric positions, so to speak, and in this light it affords us room for argument.

The term heroism is often a misnomer for selfishness, and in no sphere, perhaps, does this apply with more aptness than in the practice of dentistry. The dentist who employs so-called heroic measures in the fearless removal, beyond the bounds of necessity, of strong and healthy tooth-structure, so that he may erect a glaring and artistic substitute of gold, is either intensely selfish or grossly deluded, for at the expense of his patient's comfort and, unwittingly, sometimes, his own vitality, he seeks to cover himself with glory, while he in no wise enhances the appearance of his subject's mouth, nor, relatively, compared with other possible means of restoration, does he truly compensate his patient or himself for the vital strain and effort.

A few weeks ago I replaced with a porcelain crown a tottering gold bicuspid contour filling of heroic proportions, which had been electro-malleted into place some eight years ago by a gold contour enthusiast. The operation was the result of seven consecutive hours of labor on the operator's part and seven hours of painful physical endurance on the part of the patient. It served the purposes of mastication for little more than seven years, and preserved the remaining tooth-structure from decay for scarcely half that

time, as indicated by the extent of decay around the base, nothing but the deep-root anchorage serving to retain it. Now, the question arises, does such work pay when all the elements of time, labor, endurance, and expense are taken into account?

Such operations are unquestionably heroic in artificial conception and extent, and yet there is a conservative idea in the leaving of weak enamel walls, a conservatism which is false, for it is exposing, rather than protecting, a weak point. A little more of the heroic in the removal of such walls, and the substitution of a gold, porcelain, or combination crown would be more durable, and avoid much labor and all the suffering and necessary endurance by the patient.

In progressive dentistry there is danger of going to extremes; there is a tendency to overdo; we are apt to get on hobbies and ride them too hard. The lamented Dr. Marshall Webb, a noble, self-sacrificing man, made this mistake; he did much for dentistry, and through dentistry for humanity; but one of the effects of his teaching has been to develop a class of contour enthusiasts; and some of these, in emulating the example of their illustrious teacher, have gone to greater extremes than even he ever dared to; and, without the skill he possessed, have made many sorry failures. We have all seen cases of gold contours in which the principle was carried to an excess which brought the filling beyond the original lines of the tooth; and this undue exposure of masticating or cutting surface, no matter even how well the work was done, would surely bring about its own destruction; such operations are certainly heroic, and, compared with the other extreme of cupped fillings, are perhaps less efficient as preservative measures. It has always seemed to me that in the building of large contour fillings, which involve the masticating surfaces of bicuspids and molars and the cutting-edges of incisors or cuspids, it is better to keep within bounds; in other words, to have the restored portion a little within the limits, as a rule, of the original outlines. This I would call conservative contour.

In prosthesis it is certainly heroic practice to excise strong and healthy incisors or cuspids so that the roots may be used for attachment of a dental bridge, but the latter can be made quite as substantial and sightly by properly fitted open-faced gold caps as anchorages, entailing the sacrifice of but little if any tooth-structure.

The heroic proportions, compared with the meagreness of its support, of some exaggerated bridge-work—or its ruins—which we

have seen sometimes cause us to wonder why some men do not experiment upon the yielding sands of the ocean beach where they might drive a pile or two, and then, by building and building to this pier, learn just how far it is possible to project a cantilever over the boundless waves without crushing its support or itself. Happily, however, those who thus abuse the prosthetic idea and the principles which have been evolved from chaos for mankind's good, are largely in the minority, and belong principally to the charlatan class, which breathes a peculiar atmosphere, and is almost as distinct from legitimate dentistry as is the witch-doctor from the true physician.

Perhaps the one branch of practice which affords the best opportunity to demonstrate the difference in virtue between the heroic and the conservative, as applied to that branch, is the treatment of exposed pulps. I shall not enter into a discussion of this subject here, but the test can be made in a given case by employing the best known means of capping, and when, sooner or later, you are satisfied, by the result and inflammatory action, that there is an incompatibility in that tooth, then remove the stopping and try heroic treatment; presuming that the after-treatment is properly done, your testimony will undoubtedly be in favor of the latter, and yet there may be, and doubtless are, cases of exposed pulps which live comfortably under so-called conservative treatment for an indefinite period of time; but in all our profession I know of but one man who claims to be uniformly successful in this line.

It may not be improper to term heroic that firmness on the part of the practitioner which prompts him to insist upon pursuing that course which in his judgment the exigencies of any particular case indicate irrespective of his patient's judgment and wishes.

We are guided by our judgment in applying means of relief for whatever lesion confronts us, and firmness in our judgment inspires our patients with the necessary confidence in us.

We should employ heroic measures when necessary, and conservative when admissible; but whatever the character of our manipulations, a conservative interest in the sensibilities of our subjects should never be lost sight of; every operation should be performed as nearly without pain as it is possible with the facilities at our command. Unfortunately for us, many of our manipulations are necessarily so painful, notwithstanding the exercise of the greatest amount of care, that our patients regard us as heartless beings and themselves as the heroes, and in some cases, doubtless, their estimate is true, but to practise dentistry honestly, conscientiously,

as most of us do, requires a heroism which the public is unable to appreciate. We are sometimes accused of being mercenary, of working only for gain and demanding exorbitant fees. No estimate of humanity could be more unjust. We recognize that it is not all of life to pursue a selfish end, to work and strive for self-aggrandizement, to jostle and crowd, to scuffle and tussle for worldly gain. We, as dentists, exercise our professional attainments for compensation; we expect, and sometimes receive, a fair remuneration for our services, for by that we live largely; but underneath the business surface of our professional intercourse with our patrons there is a nobler purpose, a grander aim,—a desire to give to our patients the benefit of all the skill we possess, to do for them the best we can, to work for them rather than upon them. We like to feel, when an operation is completed, that it is well done, that as a recompense for our self-sacrifice we have reached a substantial result.

There is a feeling of satisfaction in contemplating an operation well performed, an operation which gives promise to meet the intent of its building, that cannot be approached by any pleasure occasioned by the mere receipt of a money fee.

And surely this is not selfishness. Our patients' interests more than our own is the issue. We like to know that some one has been benefited by our effort, that humanity has been well served by the restoration, at our hands, of an impaired human function, and this, more than anything else, is what characterizes us as a profession,—the self-sacrificing interest in the welfare of our patients. We labor to prolong life; not our own, but that of those who come under our care.

DISCUSSION.

Dr. Peirce.—I think Dr. Kratzer strikes the key note when he says that we ought to work for our patients' benefit rather than our own glory. I remember some few years ago a lady coming from a neighboring city. She told me she had paid six hundred dollars for having her teeth contoured, and she had not had a comfortable day since, although she had tolerated the work for several years. It was beautifully done, but on frail teeth with roots predisposed to irritation, and while there were no suppurative processes, yet the gums were tender. There were two bicuspids that especially troubled her, and she requested some relief. I took out the fillings and cleansed the devitalized roots. The teeth had been wedged apart previously to contouring, and had not been allowed to return to their normal position. The fillings extended over the faces of the

roots so that there was constant impingement of the crowns, one upon the other. She said she did not mind the appearance of gold, so the roots were supplied with gold caps, and these she is wearing comfortably to-day.

It is a mistake to keep patients in the chair four, five, or six hours, while malleting a gold filling, when we could make a better operation by trimming off the tooth properly and adjusting a collar and a porcelain crown.

One of my patients said, I don't see any necessity for having my teeth fixed, if I am to suffer a penalty equal to death, and she was correct in this opinion. There are dentists who delight in large contour fillings, which so exhaust the patients that they oftentimes are in bed for days.

Where we have an approximal surface of a tooth to be restored, it should be contoured carefully. But where half or two-thirds of the crown is gone it is unjust to the patient to build it up piece by piece.

Dr. Faught.—The day for the heroic in dentistry is passed. There are times when it may be good to indulge in these protracted operations, but when we do that kind of work it is only as a necessity. The more we shape our practice to the conservation of the teeth by the easier and less protracted operations, the better it will be for our patients and the better for us individually.

My own practice is made up to some extent of nervous people. Many times I have seen an opportunity for building up large fillings, but I have adopted other methods.

Particularly do I believe the conservative method of the greatest value where we have to deal with children. I remember a case in my practice where I had a family of three or four boys over a period of three years, and just this winter am I successful in placing all their mouths in perfect condition, but it was only by doing conservative work while they were young that I was able at the proper time to replace plastics with gold.

I will recite a case that left a profound impression on me. It was with a family of three children,—nervous, growing girls. These children came to me, and by the use of gutta-percha against the frail enamel walls I was able to make them comfortable, and to bring their teeth into the condition where later on I would be able to execute more lasting and permanent gold work.

One year, just as the summer months were approaching, I failed to see one daughter. She was away at boarding-school.

The mother said she thought she would have to excuse her from seeing me until after vacation. I warned her that there was a cavity that ought to be attended to, and that in a few weeks I would be closing the office and going away on my summer trip. The patient did not come in. During the time I was away the father took this daughter to his dentist, who not only filled this cavity, but suggested the removal of the gutta-percha fillings, and also suggested that there had been a good deal of very poor dentistry executed there. It was summer time, when our visits are not as numerous as they might be, and he ruthlessly cut away the enamel. The teeth were so sensitive and tender that he was obliged to etherize her in order to excavate the cavities and prepare for the insertion of the filling. She spent two or three hours in the chair each sitting, and in going out on one occasion fainted at the corner of the street.

He not only did that, but went further and suggested that perhaps the other daughters' mouths had been under the care of the same gentleman and were in the same condition. The father, very much exercised, took the other children there and had them treated in the same way. The result was that not one day elapsed that those children were not in agony; every mouthful of hot or cold food in the oral cavity brought tortures and pangs, and they never had one moment of peace from the day they sat in the chair until in the fall, when they came to me again, brought back by the mother, who desired that I should take away the heroic operations and replace them with similar gutta-percha fillings to those that were there before. I could not do it, of course; the enamel walls had been cut away to the very edge; but I did the best I could. The result was that the pulps died, and the mouths now are wrecks in comparison with what they might have been had conservative dentistry been allowed full sway.

There is another thing that I have been very much interested in. There is a little preparation in the market to-day under the name of Power's antiseptic balsam, and I have been giving it a trial, with much satisfaction. It is used by touching it to the cervical edge of the cavity, without cutting retaining pits. It is easy to attach the first piece of gold to the walls, and thus excellent and desirable gold fillings can be made without subjecting the patient to the pain or the detriment of cutting away the cervical edge, and leaving the enamel without dentine back of it. Care is to be exercised to place it well back within the cavity.

Dr. Jamison.—I cannot say that I entirely agree with the former

speaker. I have not been a great advocate of plastics; I rather incline to the gold theory where it can be properly used. As we get older we become more conservative. The majority of the young men who come from our colleges are apt to be heroic; very apt to delight in large gold fillings and contours, and I think, in a measure, it is good that they do, if the patients are not made uncomfortable. I am not an extremist. The key to the whole subject is judgment; this should be exercised, and that covers the whole ground.

Dr. Boice.—While the paper was being read my mind reverted to the case of two sisters who did not dare to come to the office alone. They had in previous operations required the attention of a physician after they had been to the dentist, but after I had had charge of them for about a year they no longer feared to come alone.

I met a gentleman on Chestnut Street one day, and he said, "By the way, won't you make an appoinment for my wife? She has lost another of her fifty dollar fillings." I did so and filled the cavity in twenty minutes with amalgam. The original filling had required seven hours and she was in her room for one week. The gold filling lasted four years and the amalgam has been there for seven.

The gentleman who put the fillings in, I think I can say, has been one of the experts in packing gold in the city of Philadelphia. He believed in the heroic treatment. He said he never filled with amalgam; he despised gutta-percha.

I have long ago abandoned the idea that it was my duty to punish patients by keeping them in the chair three, four, or five hours to build up an old root with gold when I could put a crown upon it that would be more serviceable.

The essayist suggested something about sea-sand and a cantilever bridge. The mass of crown- and bridge-work has been appalling. To-day I examined a crown on a bicuspid, the band of which was much too large, while it extended an eighth of an inch under the gum all around. That is indeed heroic treatment. In crown- and bridge-work to-day, this illustration is not an exception, but one of the average operations.

Dr. Warren.—I agree with Dr. Jamison that judgment is essential. As far as plastics and gold crowns are concerned, both are to be used. All of us see crowns and bridges which should never have been placed in the mouth; but, at the same time, it is not advisable for us to speak of bridge-work and crown-work so as to

make the impression that it is all bad. There are instances where a crown is the only means of saving a tooth. There are times when we find good firm roots where bridges can be placed to advantage. I have put fourteen teeth on a gold bridge (or band), anchored to two molars and two cuspids, and I have known such bridges to give excellent results. It is not advisable, as a rule, to go to extremes in any line of work, but as far as crown- and bridge-work is concerned, if it is properly done, much permanent good will ensue to the patient. As Dr. Jamison said, judgment is the all-important factor.

Dr. Broomell.—I reverted in my mind to the beginning of my practice when Dr. Kratzer spoke of Dr. Webb. And while he was certainly an extremist as to the matter of gold work, and while his fillings were excellent, there is no question but that he overdid the matter. There seemed to be what might be termed a filling craze, and everything must be filled with gold. I remember a case I had myself while at college. It was a bicuspid tooth, upon which I placed the rubber dam at nine o'clock in the morning and kept it on until four in the afternoon. When the work was finished, it was a very satisfactory operation. But that can now all be done away with by a perfect-fitting gold crown.

The essayist spoke of open-faced gold caps as being preferable in many cases, or probably in all cases, to the solid crown. I don't see how it is feasible to allow edges to remain unprotected which must continue intact if the secretions are not to disintegrate the cement underneath. I should think, under these conditions, it would only be a question of time when the crown would have to be removed.

Dr. Kratzer.—As to the remarks of Dr. Broomell in respect to open-faced crowns, I maintain that when it becomes necessary to remove them on account of leakage, we can still incise the root and put on a Richmond crown, having put off the final operation and gained valuable time.

Dr. Jamison.—I might say that I do not agree with Dr. Broomell as to open-faced crowns. I can cite a case where they gave me much satisfaction. A patient came to me with two bicuspids where the inner cusps had been broken; the teeth were still vital. By making an open-faced gold crown I was able to save those two teeth by showing very little gold at the cutting-edges, and the pulps were saved.

Dr. Kratzer made a good point when he said that, though an open-faced crown only lasted five or ten years, if you can save the

superstructure five or ten years you are certainly in a good position to save the root for a number of years.

Dr. Tees.—My experience with open-faced crowns, as far as bridge-work is concerned, has been the same as Dr. Warren's. I have seen many put on, and with very good results, but if they are improperly constructed, they are worse than nothing.

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